American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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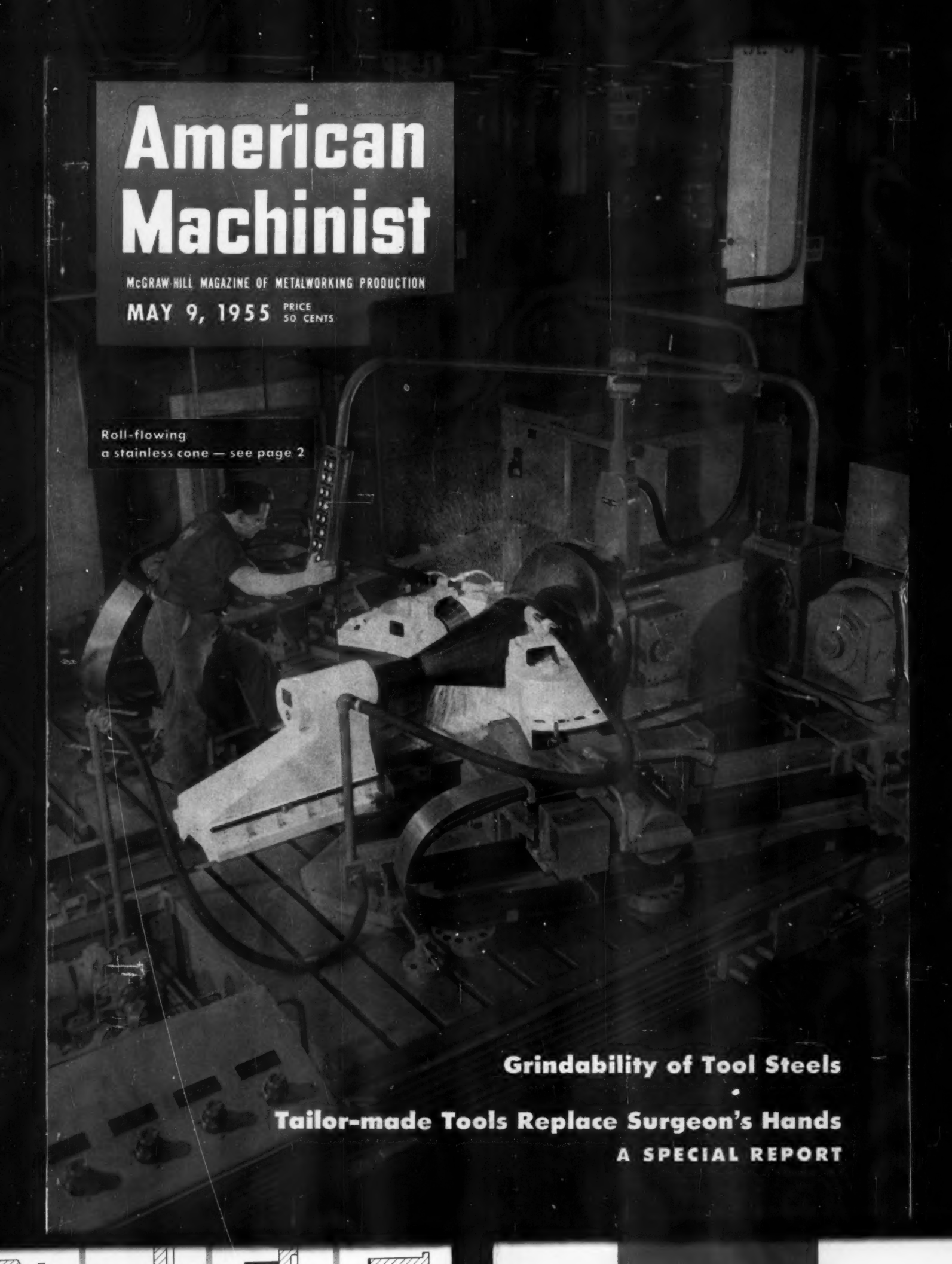
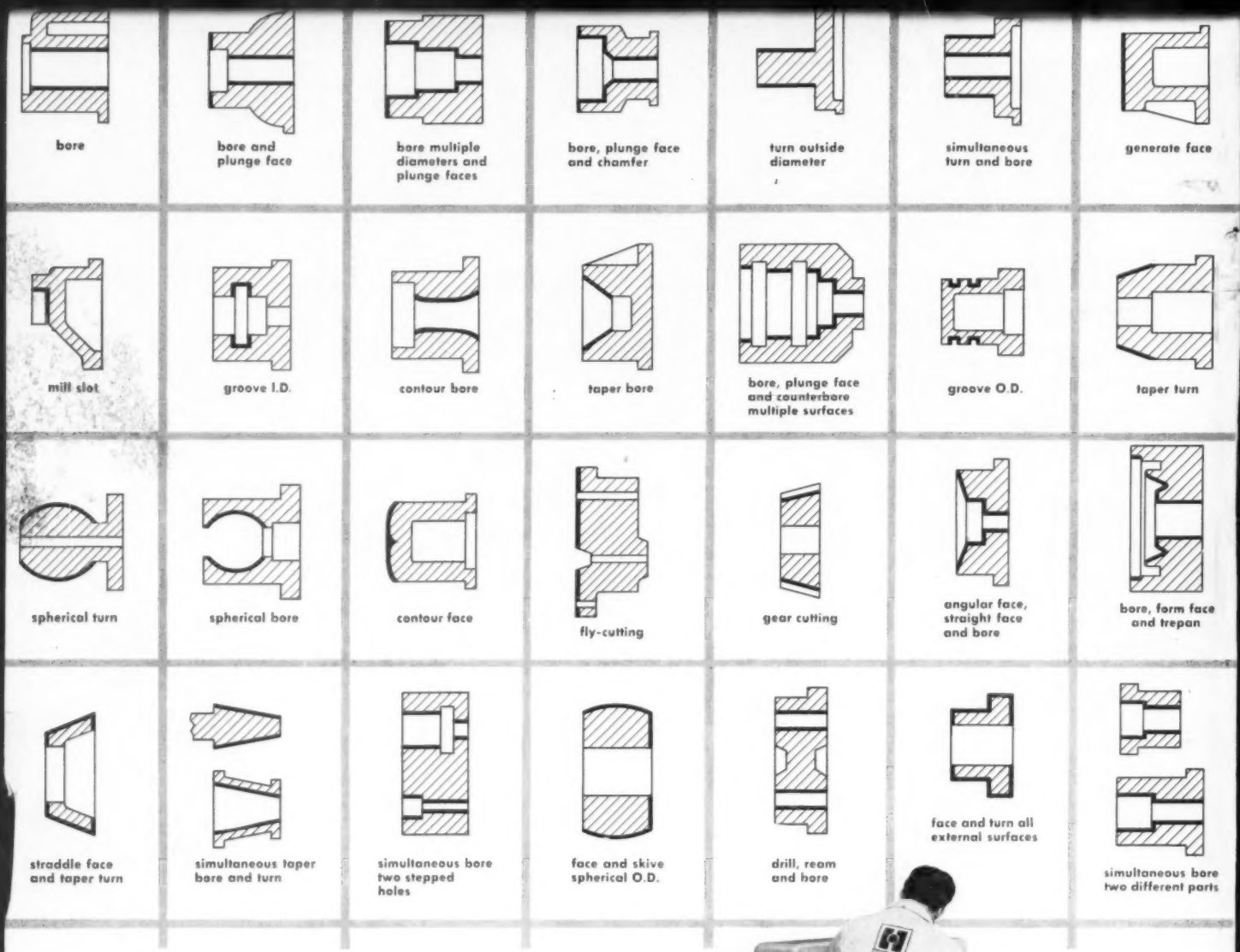


Roll-flowing a stainless cone — see page 2

Grindability of Tool Steels

Tailor-made Tools Replace Surgeon's Hands

A SPECIAL REPORT



which of these operations can't be done on a Heald Bore-Matic?

With one exception, all of the operations shown here, plus many more, are routine for a Heald Bore-Matic — a *single-end* Heald Bore-Matic using a *single setting*, as a matter of fact!

What's more, practically any of these operations can be *combined* in a single, high speed automatic cycle — finishing a variety of different surfaces, either simultaneously or in sequence, at a single setting. This fact makes a Heald one of the most *versatile* and *productive* precision finishing machines ever developed. As you have probably guessed by now, the one job shown that a Bore-Matic can't do to advantage is gear cutting.

Whatever your borizing problem, you'll find that IT PAYS TO COME TO HEALD!

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NUMBER OF COPIES PRINTED THIS ISSUE 38,836

GEAR TEST GRAPH
GLEASON WORKS

chips

ROLL FORMING . . . Power spinning, or roll forming, is an unusual process with many achievements, among them the shaping of large circular-cross-section pieces in wide variety. It can begin with sheet, plate, casting or forging, and end up with wrought metal of excellent characteristics in an otherwise-very-expensive shape. Our front cover pictures a typical operation on the new Hydrospin machine, and a 6-page article in this issue gives engineering detail. Co-authored by Kenneth W Stalker of the GE Evendale (Ohio) jet-engine plant and Kenneth W Moore of Cincinnati Milling Machine Co, it is an authoritative summary of development work undertaken by these two companies on jet-engine parts. Details on the machine itself are in our New Shop Equipment department. The color photographer was Tom Ware of GE.

ASST SURGEONS . . . Our Special Report in this issue is a very unusual—and heart-wrenching—one. It describes the work of toolmakers at the National Institutes of Health, Washington, DC. They tailor-make, mostly of stainless, the delicate yet sturdy special instruments that doctors there need for their study of humans and animals. Many of these ingenious tools replace a surgeon's hands in a tight spot. Associate Editor Wright came upon the story when he was checking on a picture sent us by Cincinnati Lathe that showed a *big* lathe department. Why is it so big? Because the whole shop is big—a toolroom for research and development. Here's the story, our most unusual in a long time.

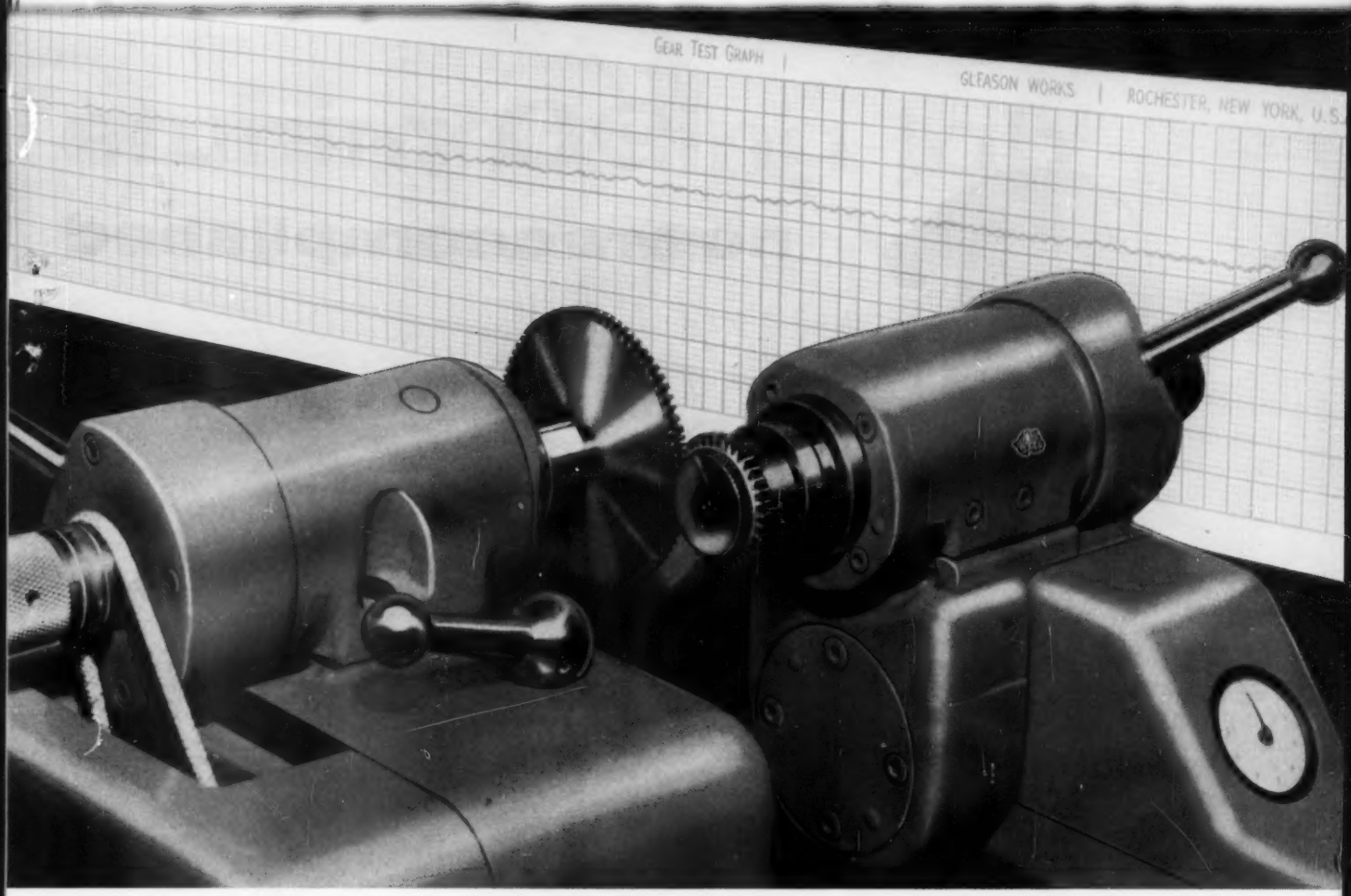
HOW TS GRINDS . . . Our lead article presents first extensive data on a vital subject—the grindability of tool steel. Clifton Nickerson (see biog) of Norton has assembled results of research by Dr Leo Tarasov, which permits grouping of steels by grinding properties. This, in turn, results in a new set of wheel specs for various operations for each group—the most practical and detailed specs we've seen.

OVERHAUL . . . John Gell, plant manager of Potter Instrument Co, Great Neck, NY, has given us a set of before-and-after photos of his small shop, plus details of the plan to make major rearrangement of equipment without disrupting production.

TOOLING . . . Three articles in this issue cover latest production tooling practice. First, we show how Chrysler makes small parts to very close tolerances for the power-steering unit. . . . Then, in two quick pages, Dale Miller, factory manager of Rochester (Mich) Gear Works, explains the broaching of internal-gear teeth to "tenths." . . . Lastly, a page shows the record system used by Hartford (Conn) Machine Screw Co for barrel finishing. It is based on a great variety of job-shop experiences.

COMING . . . May 23 *AM* will include a thorough 12-page Report on Allison's inspection methods, feature articles on new planer tools, how to use tracer lathes, the new Ford tappet line, mechanized tank production, powder metallurgy in Europe, and a tricky boring job.

TOOL STEEL GRINDER . . . Clifton C Nickerson, born in Abington, Mass, attended Wentworth Institute for two years, Worcester Poly for four years and took special night courses at Worcester Junior College. Mr Nickerson came to Norton Company in May, 1941, as a tool designer in the Grinding Machine Division. He served with the Navy for three years during World War II. When he returned from service, he was employed as a heating engineer with Worcester Gas Light Company. In 1952, he rejoined Norton as a sales trainee, is now grinding engineer in Sales Engineering. He is a member of the ASME, and authored our lead article.



Make a complete test and record of your small spur and helical gears

You can be certain that your spur and helical gears will operate correctly in their final mountings if you give them a complete test *before* actual assembly.

The new Gleason No. 104 Spur Gear Tester gives you a complete check of your gears. A rolling test for composite error provides a quantitative check of tooth spacing, profile shape and runout.

In this test, the gears are slowly rotated while a calibrated spring load keeps them in metal-to-metal contact. Any error in the gears results in a horizontal movement of the drive spindle. A completely electronic pickup and recorder make a *permanent* chart of the results.

But there is still another test you can make with the No. 104 Tester—a running test, which simulates actual operating conditions, determines the smoothness of operation, noise characteristics, and tooth contact, which will actually be obtained when the gears are used.

This machine tests precision and commercial gears up to 4½″ center distance.

We will gladly furnish further information on the No. 104 Spur Gear Tester. Write for our bulletins.

The No. 104 Tester is furnished complete with an electronic pickup and recorder unit, as shown above.

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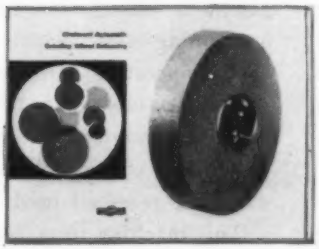
AUTOMATIC WHEEL BALANCING

In the illustration above, the operator shows how easy it is to balance the grinding wheel on a CINCINNATI FILMATIC 10"x72" Plain Hydraulic Grinder.



Publication G-637-1 explains the Cincinnati Automatic Balancing principle. Write for a copy.

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CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES

exasperating job

easily in seconds

Have you ever seen an operator balance a grinding wheel mount on conventional static balancing ways? It's a tedious operation, and may require 90 minutes or more to remove wheel mount, balance and replace mount. Cincinnati did something about this. They developed automatic grinding wheel balancing that does the job ten times more accurately and infinitely quicker and easier.

This exclusive Cincinnati feature automatically balances the grinding wheel mount on the machine . . . within a few seconds . . . while the spindle rotates at its operating speed. **This exclusive Cincinnati feature** eliminates vibration and resultant chatter on the work . . . permits more effective stock removal . . . reduces wheel cost per workpiece.

FILMATIC spindle bearings and automatic grinding wheel balancing constitute a team that just can't be beat for lower cost precision cylindrical grinding. Best of all, these features are **standard equipment** on CINCINNATI FILMATIC 6", 10"-L, 10", 14"-L, 14" and 16" Plain Grinders, and on 6", 10"-L, 10" and 14"-L Angular Feed Plunge Grinding Machines. Extra equipment other sizes. Write today for the complete balancing story. Ask for publication No. G-637-1.

CINCINNATI GRINDERS INCORPORATED
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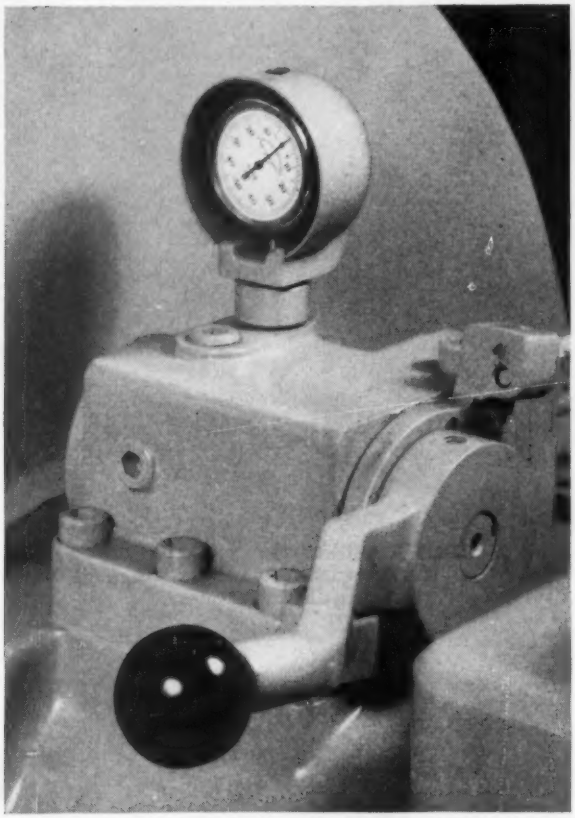
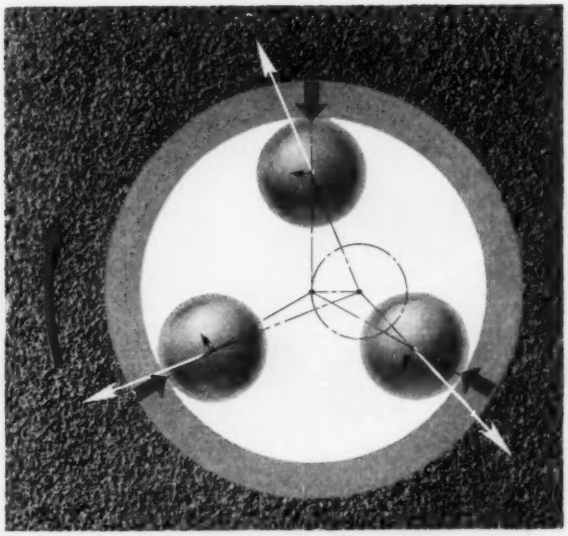
MACHINE TOOL SHOW
INTERNATIONAL AMPHITHEATRE
CHICAGO, ILL.
SEPT. 6-17, 1955
BOOTH 1205



Automatic balancing control lever and indicator.



Here's how it works. Three steel balls are carried in a raceway in the wheel end of the spindle. As the spindle rotates while the elastically supported bearing assembly is unclamped, the balls are free to move and correct any unbalanced condition that may exist. Then the complete spindle and bearing assembly is locked in position to form a rigid mounting, retaining the advantages of FILMATIC bearings for precision cylindrical grinding.

CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

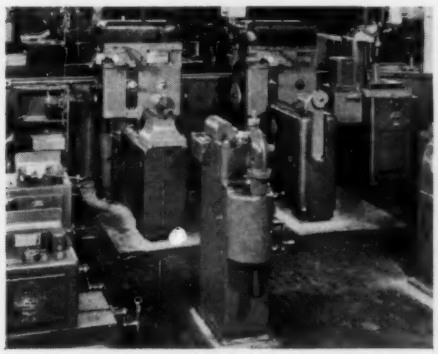
HOW TO TOOL UP FOR Ver

18 GEAR SHAPERS start with a pair of late model 36-Type Machines and run down the size range to two modern 3-Inch Fine-Pitch Machines

THE *Fellows*

satility

The Steel Products Engineering Co., Springfield, Ohio pins its faith to FELLOWS gear production equipment FOR ALL SIZE CLASSIFICATIONS



7 FELLOWS GEAR INSPECTION INSTRUMENTS include Red Liners and Involute Measuring Instruments

Equipped with Fellows Gear Shapers of different sizes ranging in capacity from 3″ up to 36″ along with Fellows Inspection Instruments for checking gear profiles, tooth accuracy, etc.... this well organized precision shop can profitably handle jobs in *all* size classifications. They cut fine instrument gears of Aircraft Quality... small and large diameter internal gears... cams, ratchet teeth, interrupted profiles, segment gears, and many unusual contours possible only with the Fellows Method.

In addition to the versatility of Fellows Gear Shapers, another feature that pays off for Steel Products is the quick and easy change-over from one job to another on these machines... a very important cost factor when frequent job changes and both long and short runs are involved.

Our Sales Engineers can give you the facts about the value of Fellows equipment in your plant. Call our nearest office.

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If You Do Horizontal, Angular and Vertical Milling

Why Buy Two when ONE VAN NORMAN Ram Type Milling Machine will increase production, . . . cut costs!

Phone, wire or write for complete information about these cost cutting millers.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

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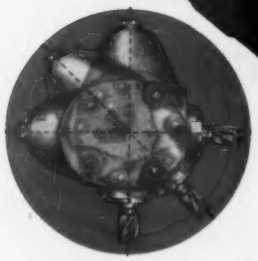
MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

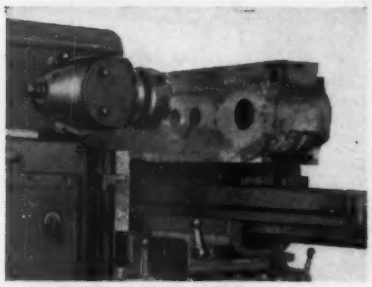
NO. 28 . . .

one of 10 new Van Norman Ram Type Millers

TABLE SIZE: 58″ x 13″
CUTTERHEAD MOTOR: 7½ H.P.
RAM MOVEMENT: 29″
18 FEEDS; 12 SPEEDS

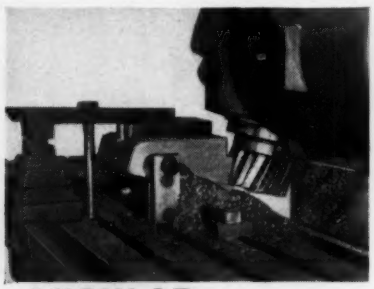


THE ADJUSTABLE CUTTERHEAD PERMITS HORIZONTAL, VERTICAL OR ANGULAR MILLING ON ONE VAN NORMAN MILLER.



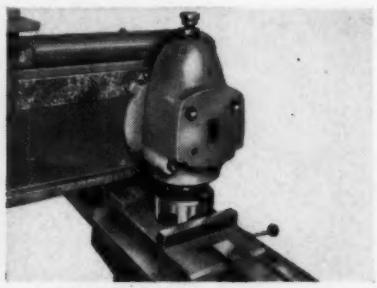
HORIZONTAL . . .

A heavy horizontal milling cut performed on a milling machine ram. The rigidity of machine prevents chatter. Material cast iron; Cutter 8″ Carbide Face Mill; Speed 189 rpm; Feed 15 ipm; Depth of cut 3/16″; Width up to 7″.



ANGULAR . . .

An angular milling operation is being performed on a workpiece. Angular range of cutterhead is 0 degrees to 90 degrees. Accurate positioning is simplified by easy-to-read graduations.



VERTICAL . . .

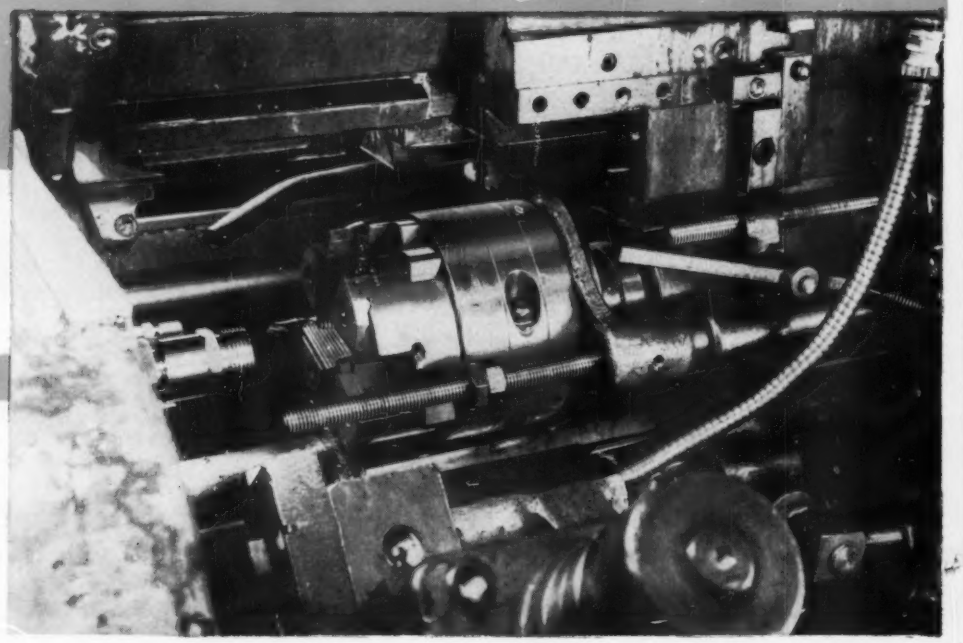
With Cutterhead in vertical position, cast iron saddle body is milled with a 6″ Carbide Face Mill. A heavy finish cut is made. Speed 267 rpm; Feed 14½ ipm; Depth of cut ¼″.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

For EXTERNAL THREADING BY "Automatics"

LANDEX HEADS Feature Wide Range, Compact Design



WORLD'S

The

● A 1¼" JX LANDEX Head on a 1¾" Warner & Swasey Automatic is shown threading ¾" Press-Lock spuds. 1" Straight Pipe threads are cut on B-1113 steel, with an average of 3000 pieces threaded between chaser grinds. These spuds are one of the many types of industrial hose couplings and valves produced by the Dixon Valve and Coupling Company of Philadelphia.

The LANDEX is a yoke-operated head compactly designed for use on live-spindle machines where die head clearance is limited. They are built in ½", 13/16", 1¼", and 2" sizes, and each size will cut a wide range of thread diameters. For example, the 1¼" LANDEX shown will cut threads ¼" to 1¼" in diameter, and oversize chaser holders (available for all LANDEX JX Heads) will allow cutting thread diameters up to 2¾".

Write for Bulletin F-90.

LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U.S.A.

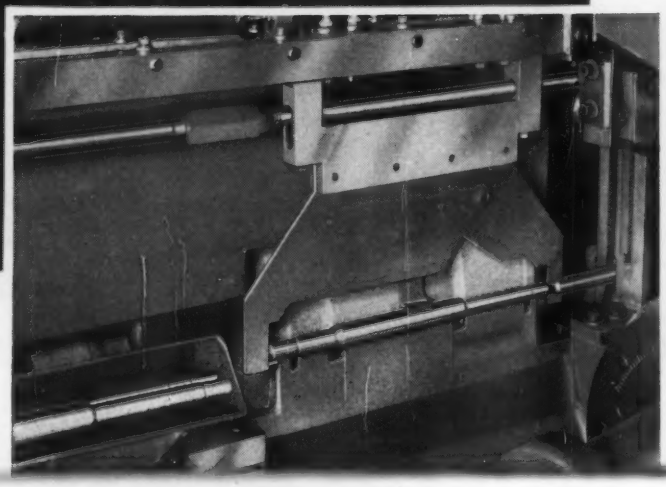
360-C

Cuts Both Grinding and Inspection

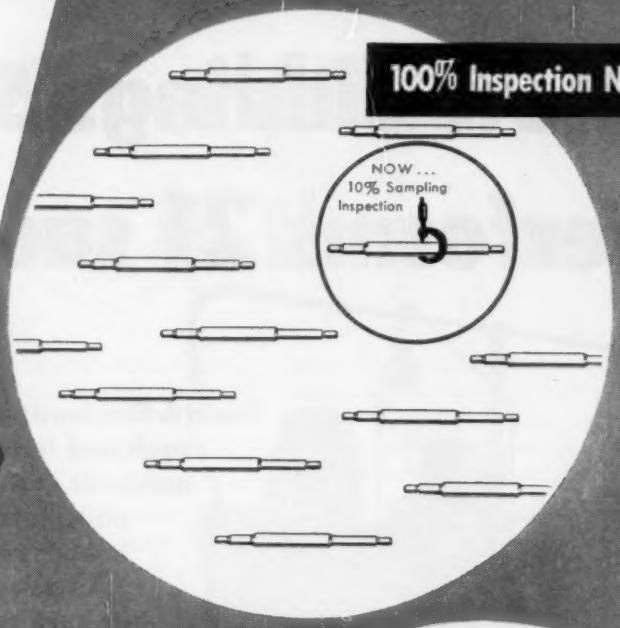
Improves work uniformity from .0007" to .0003"

Since using two Landis No. 12½ Centerless Grinders, a major automotive parts manufacturer is now grinding shafts with these results. The superior accuracy of these grinders at high production rates is due to their unmatched rigidity.

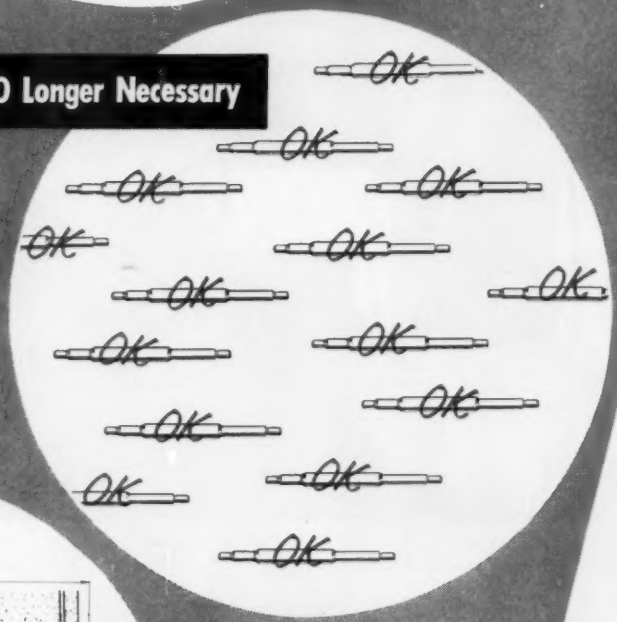
#12½ Centerless Grinder with automatic loading and unloading.



Costs



100% Inspection NO Longer Necessary



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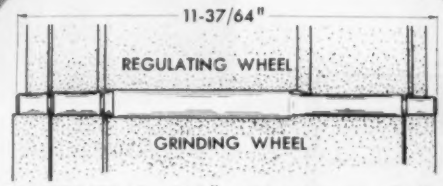
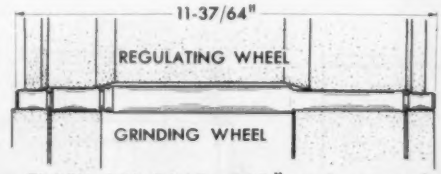


ROUGH GRINDING: .010" stock removal—5 diameters



FINISH GRINDING: .003" stock removal
—4 diameters

Grinds 380 Shafts per Hour

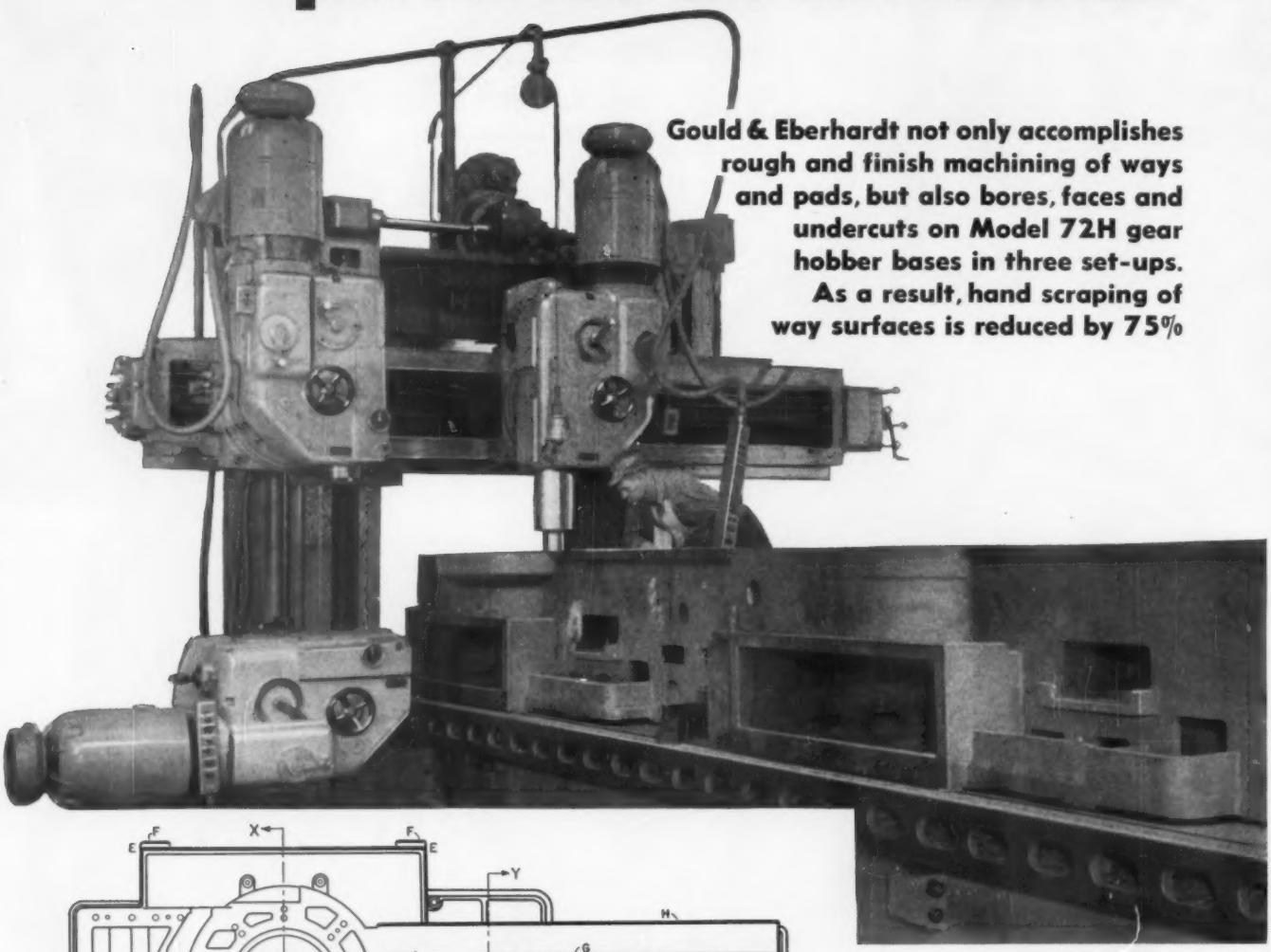
185

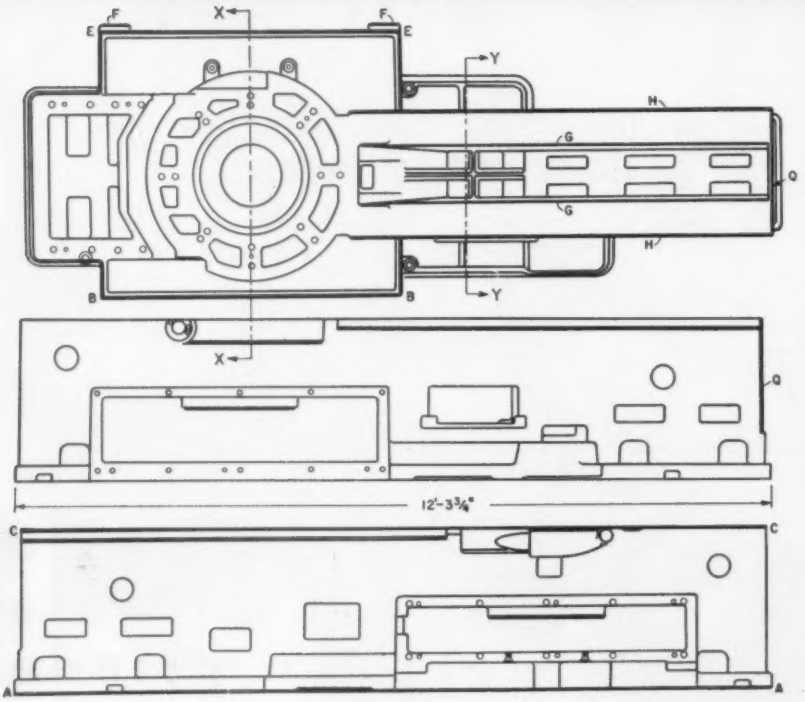
LANDIS TOOL COMPANY
WAYNESBORO, PENNA., U. S. A.

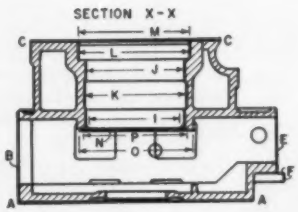
LANDIS
precision grinders

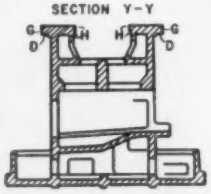
How Giddings & Lewis performs 21 successive

Gould & Eberhardt not only accomplishes rough and finish machining of ways and pads, but also bores, faces and undercuts on Model 72H gear hobber bases in three set-ups. As a result, hand scraping of way surfaces is reduced by 75%









Hypro Planer-Miller operations in three set-ups!

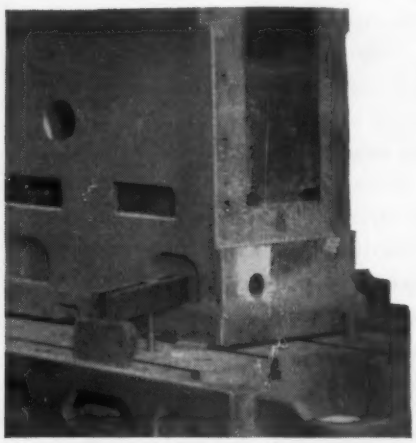
Do you want to reduce repositioning of workpieces and increase the number of machining operations per set-up? Then look at all the work accomplished on a G&L Hypro Planer-Miller at Gould & Eberhardt, Irvington, N. J.

Two 12′ 3¾″ Meehanite gear hobber bases are clamped end-to-end on the 30′ worktable. A total of 21 successive rough, semi-finish and finish cuts is made on each of the bases utilizing all four heads, sometimes simultaneously, with only three shiftings of the castings. Machining is done on ways, pads and other flat surfaces, as well as bores, faces and undercuts in the hobber spindle hole. The procedure outlined below reduces hand scraping by 75%.

When you want to perform a series of machining operations simultaneously, you can depend on a G&L Hypro Planer-Miller to do the job efficiently and economically. They are built with 30″ to 144″ width of the table and in table lengths, and in horsepower ranges to meet specific requirements. Equipped with electronically controlled drive, to the table, rail and milling heads, it permits the operator to make independent selections of motions to any unit . . . thus permitting the operator to machine a variety of materials, shapes and contours to unusual accuracy such as cannot be accomplished on conventional planer-milling machines.

For complete information, see your G&L representative today, or write direct to factory.

Builders of the world's finest heavy-duty Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

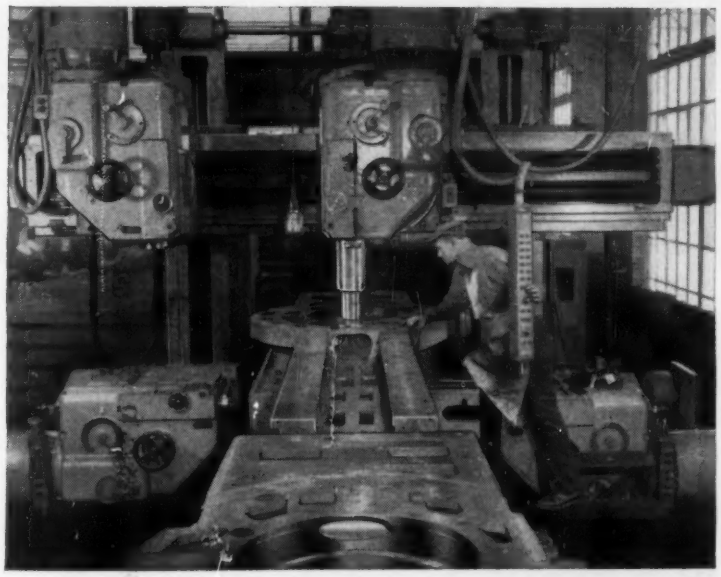


GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Machining Sequence

Rough and finish mill bottom "A" and cover surface "B".
Turn casting over resting on bottom surface.
Rough and semi-finish mill "C", underside of ways "D", index-worm bearing surface "E" and two lugs "F".
Rough and finish mill pads on side and between the ways, and semi-finish the edges on the outside "G", and inside "H".
Rough bore 20.000″ dia. "I", and 20.005″ dia. "J".
Rough and finish bore 20 1/16″ dia. "K", and 22 15/32″ dia. "L".
Rough and finish bore 22.500″ dia. "M".
Face boss "N", recess 23″ dia. "O", and counterbore 20¼″ dia. "P".
Mill end for gear case "Q".
All drilling operations intervene.
Base is then set up on the G&L Planer-Miller for finishing.
Finish mill top "C", and underside of ways "D".
Finish mill index worm bearing surfaces "E" and two lugs "F".
Finish bore 20.005″ dia. "J", and 20.000″ dia. "I".

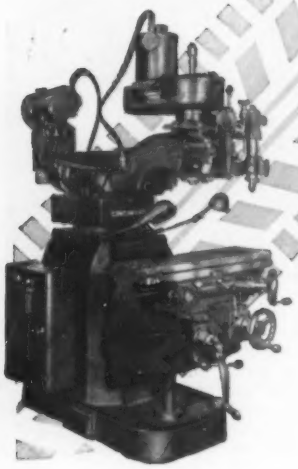


Work spindle hole is bored after completion of milling the ways. Several diameters are rough and finish bored, including undercuts on inner diameter. The faces and recesses in the boss at the bottom are turned, using a special tool holder. Precision machining ways and spindle bore on one set-up is principal reason these finished surfaces require minimum scraping to produce an excellent bearing.

Ideas are where you

. . . and you may find a good idea in this rubber mold setup

Meticulous, demanding die sinking operations are transformed to automatic, carefree operations with the Power Driven Duplex Rotary Table Attachment mounted on a CINCINNATI 8" x 18" Tool and Die Miller.



CINCINNATI 8" x 18" Tool and Die Milling Machine. Brief specs. in Sweet's Machine Tool Catalog. Complete information in catalog No. M-1731.

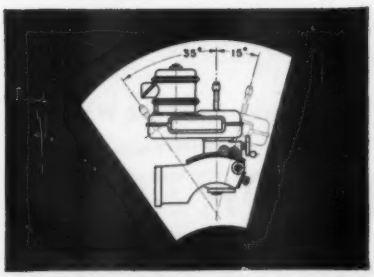
Notice how the cutter spindle and tracing head of the CINCINNATI 8" x 18" Tool and Die Miller at the right are swiveled to the most advantageous tracing and cutting position. The head can be swiveled right and left, forward and back, around a pivot approximately at the end of the cutter. Does this give you an idea? Notice the extra large cutting range evident from this setup; it's actually 8" x 18" in one setting. Does this give you an idea? Notice the power driven Duplex Rotary Table Attachment; it rotates the master and work (mold) at the same speed under the cutter and tracing finger. Does this give you an idea? There are many exclusive advantages of the CINCINNATI 8" x 18" Tool and Die Miller that you can translate into useful and profitable ideas for producing dies and molds, and for toolroom milling. Brief data on these machines will be found in Sweet's Machine Tool Catalog; complete information may be obtained by writing for catalog No. M-1731.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

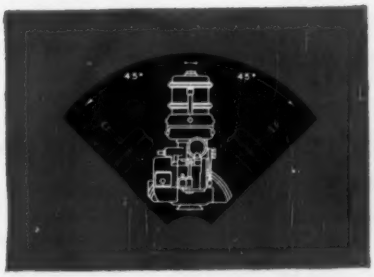
find them

Milling the tread in a tire mold. The machine is a CINCINNATI 8" x 18" Tool and Die Miller, equipped with a power driven Duplex Rotary Table Attachment.



Transverse swivel range of spindle

Longitudinal swivel range of spindle

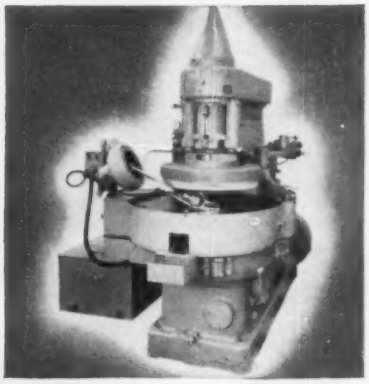


CINCINNATI

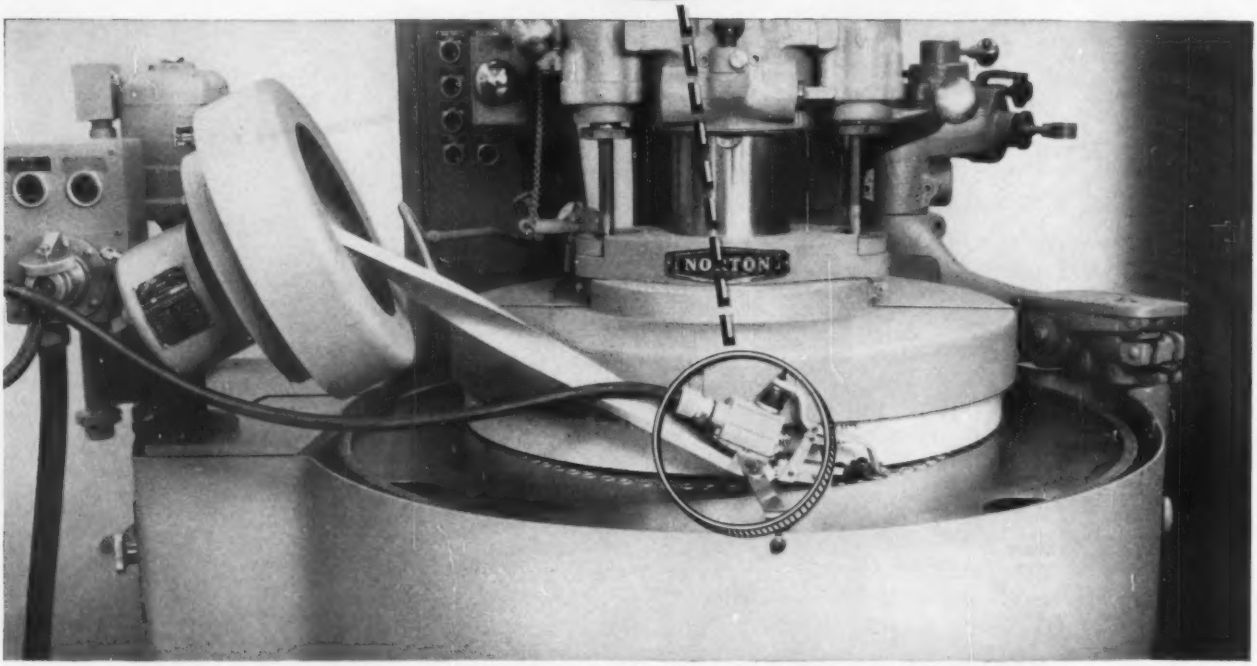
MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

On small, flat parts the Norton Thru-Feed Lapper

brings 4 to 1 savings



Norton 26 Hyprolap Lapping Machine with automatic loading features that increase production of small, flat parts difficult to handle manually as much as 4 to 1 . . . as many as 8000 pcs/hr.



Automatic Loading Arrangement of Norton 26 Hyprolap lapping machine makes sure parts are in correct position before entering feeding trough . . . prevents ganging up . . . directs work in a path that assures even lap wear.

*NEW, built-in automatic loading adds extra advantages to Norton 26 Hyprolap**

Now you can make 4-to-1 savings in lapping small parts . . . and get top-quality results on every job. Investigate new Norton 26 Hyprolap lapping machines with the exclusive built-in thru-feed mechanism.

Here's why:

1. You speed up production. Loading and lapping operations handle parts as fast as 8,000 pieces per hour.

2. You cut handling. Loading and unloading are completely automatic.

3. You reduce downtime. Work path traverses the entire working surface of each lap . . . promoting even wear . . . reducing the frequency of lap dressing.

4. You cut out operations. This lapper removes stock down to .0002" tolerances . . . makes surfaces parallel to .000025" . . . in many instances without pre-grinding of parts.

5. You use less skilled help. Filling feed hoppers and removing finished-work baskets are the only manual operations.

No wonder 4-to-1 savings are a matter of record with the new Norton Hyprolap with built-in automatic loading!

Send for Bulletin 852-7. Also submit samples of your work for production estimates. Standard hopper-feed Hyprolap machines take work up to 1¼" diameter. Modifications handle larger work. NORTON COMPANY, Machine Division, Worcester 6, Mass.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products . . . to make other products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

How Eastman Kodak gets Extreme accuracy...fine finish... years of trouble-free grinding

Norton wheel spindle a key factor in grinding performance that means...

steady savings!

Installed In March 1936 at Eastman's Kodak Park Works in Rochester, N. Y., this Norton 10" x 96" Type C Cylindrical Grinder grinds alloy steel rolls to precision accuracy and very fine finish. Original wheel head spindle bearings have required no servicing in more than 18 years of 8 to 24 hours daily operation.

The Norton Wheel Spindle Unit is an outstanding aid to the speed, accuracy and long service life of Norton cylindrical grinders. Note its over-all ruggedness and big heavy bronze bearings covering over half the spindle body.

Why are Norton cylindrical grinders so fast and accurate over such a wide range of precision finishing and heavy stock removal jobs?

Why do these hard-working machines last so long, cost so little to maintain?

Advanced features like the Norton wheel spindle unit are the answer. Advantages of this typical Norton development for better, lower cost grinding include:

- ***Over 50% of spindle body enclosed in two large heavy-duty, hard bronze bearings for extra long life.***
- ***Rugged proportions, and metals toughened by special heat treating, are further aids to long service.***
- ***Rigid support over practically the entire spindle surface affords maximum resistance to wheel pressures.***
- ***Bearing length of more than twice the diameter increases bearing life.***
- ***Automatic flood lubrication of bearings, with flow continually visible through bull's-eyes — an important safety and control feature.***
- ***End thrust taken on two large, hardened steel surfaces, also flood lubricated.***
- ***Modern precision boring for exact oil clearance keeps lubrication at top efficiency.***
- ***Wheel speed changes possible without readjusting bearings.***
- ***Extremely low unit pressure, due to long, continuous bearing surfaces, permits fast cutting and enduring accuracy.***

For further facts on how Norton cylindrical grinders can benefit your production, see your Norton Representative. Or write direct for Catalogs. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize with NEW

NORTON

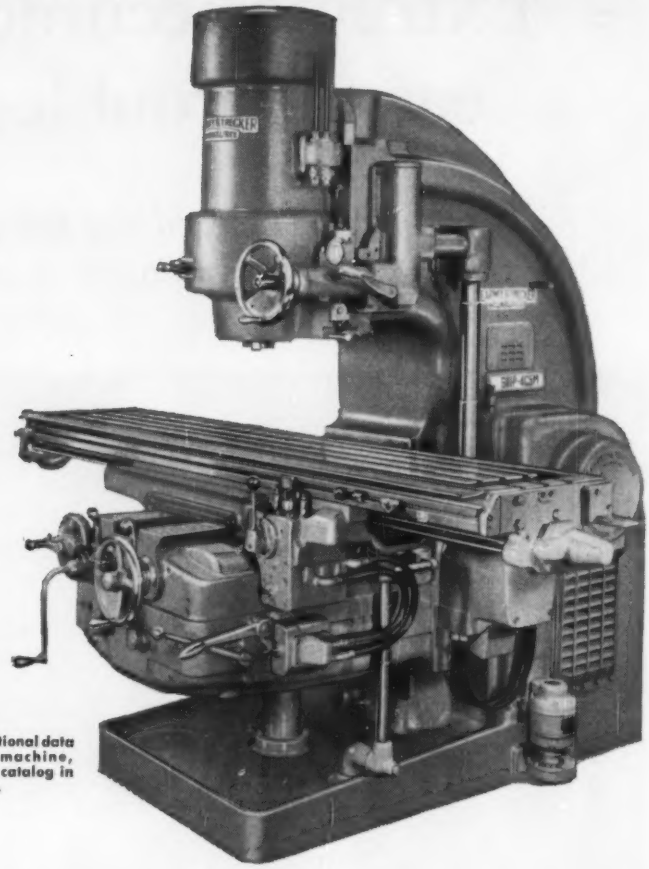
GRINDERS and LAPPERS

Making better products... to make your products better

District Sales Offices: Worcester • Hartford • New York (Teterboro, N. J.) • Cleveland • Chicago • Detroit

How can you lose when it costs

to put this new 50hp Model CSM vertical milling machine to work in your plant with...



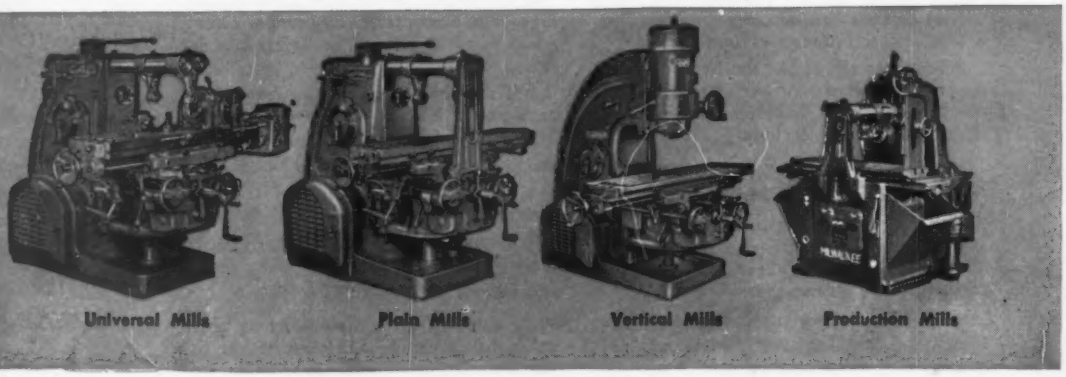
For additional data on this machine, see our catalog in Sweet's.

Kearney & Trecker's

TOOL-LEASE PROGRAM

THE MACHINE TOOL SHOW BOOTH NO. 908

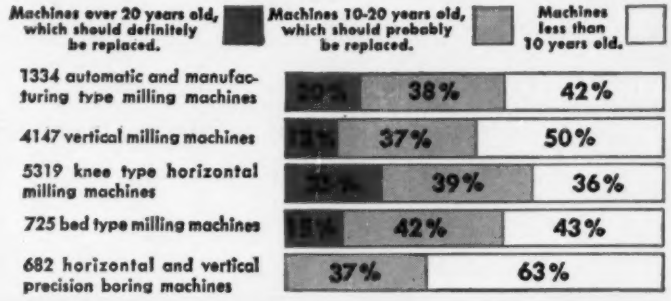
Kearney & Trecker manufactures a complete line of more than 250 standard knee and bed type milling machines and precision boring machines.



ONLY 68 CENTS PER HOUR

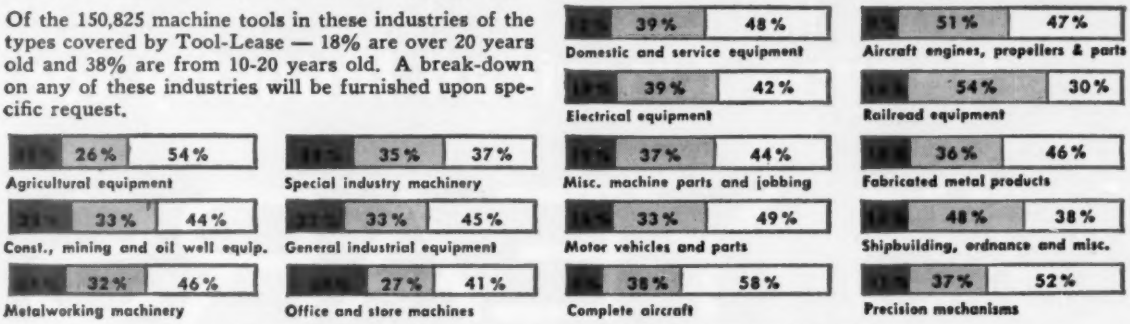
LET'S LOOK AT THE OBSOLESCENCE PICTURE IN THE ELECTRICAL EQUIPMENT INDUSTRY

Includes machines for manufacture of wiring, instruments, motors, generators, transformers, switchboards, welders, transport equipment, lamps, radios, television, phonographs, transmitters, telephone-telegraph and other communication gear. Of the total 12,207 machines in use today which can be replaced by Tool-Lease equipment—18% are over 20 years old, 38% are 10 to 20 years old.



HERE'S THE OVERALL PICTURE IN THE ABOVE AND 15 OTHER BASIC INDUSTRIES

Of the 150,825 machine tools in these industries of the types covered by Tool-Lease — 18% are over 20 years old and 38% are from 10-20 years old. A break-down on any of these industries will be furnished upon specific request.


26% 54% Agricultural equipment
35% 37% Special industry machinery
39% 48% Domestic and service equipment
51% 47% Aircraft engines, propellers & parts
33% 44% Const., mining and oil well equip.
33% 45% General industrial equipment
39% 42% Electrical equipment
54% 30% Railroad equipment
32% 46% Metalworking machinery
27% 41% Office and store machines
37% 44% Misc. machine parts and jobbing
36% 46% Fabricated metal products
33% 49% Motor vehicles and parts
48% 38% Shipbuilding, ordnance and misc.
38% 58% Complete aircraft
37% 52% Precision mechanisms

Figures adapted from 1953 American Machinist survey of metalworking industry

WHERE high horsepower is the key to faster, better production for you—Kearney & Trecker's 20-30-50 hp CSM machines are your answer. You can get CSM's in plain or vertical styles for as low as 68 cents per hour — *and even less.*

Under Tool-Lease Plan "A," one of three seven-year lease agreements offered by Kearney & Trecker, you make two semi-annual rental payments, totaling 25% of the machine's price during each of the first three years. Actually in dollars and cents, you pay only 68 cents per hour for a new 50 hp, Model CSM milling machine. That means a machine installed in your plant and in operation — *literally for pennies an hour!*

What's more, under Tool-Lease, you can rent any of over 250 different types and sizes of standard milling machines or precision boring machines. All are available under three basic plans, with varying options to continue or terminate the lease, or to purchase the equipment. If you require special machinery or heavy-duty CSM bed types, special agreements will be considered.

For complete information on Tool-Lease, see your Kearney & Trecker representative or mail coupon to Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

TOOL LEASE
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS
EQUIPMENT ®

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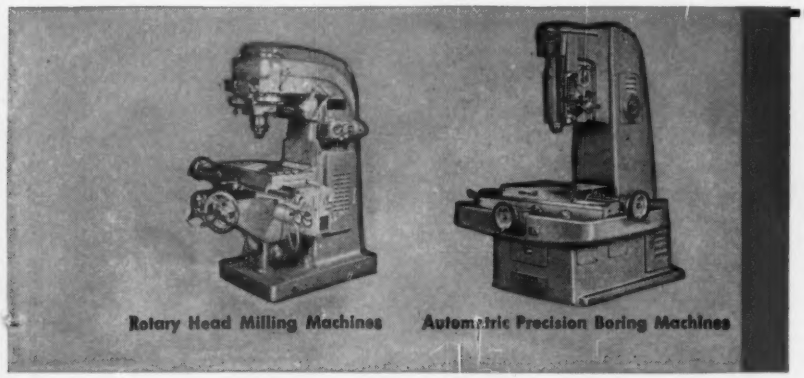


Rotary Head Milling Machines — Automatic Precision Boring Machines

KEARNEY & TRECKER CORP.
6784 W. National Ave., Milwaukee 14, Wis.

Please send me Bulletin TL-10A on Tool-Lease Program and booklet titled "Critical Picture of Creeping Obsolescence."

Name.....

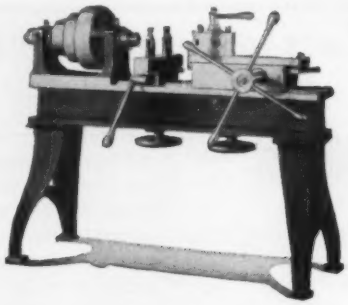
Title.....

Company.....

Address.....

City.....Zone.....State.....

1880



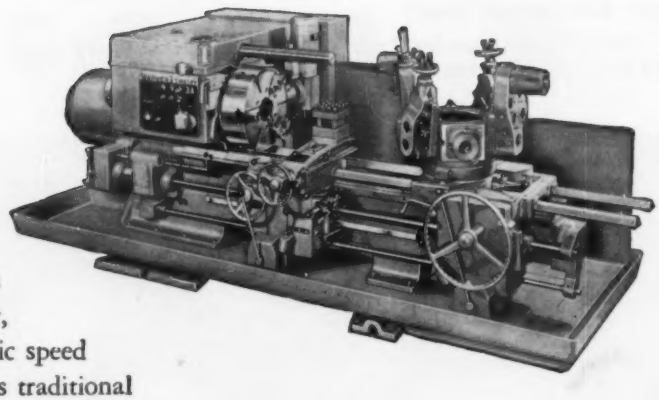
One of the first Warner & Swaseys . . .
but a machine designed to meet the high precision production requirements of its day.

Serving American Industry for

75 YEARS

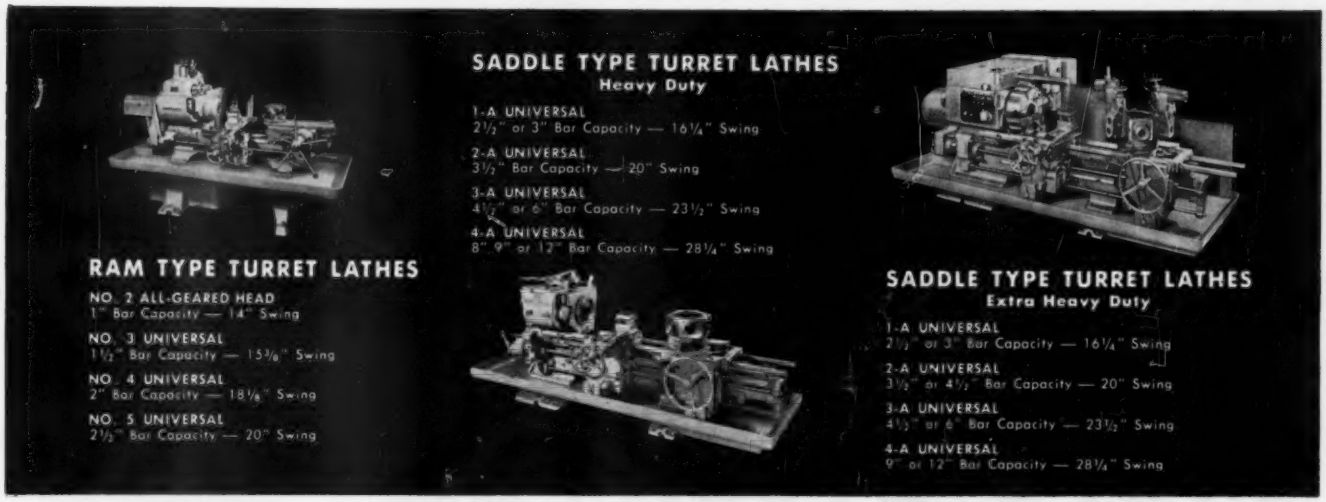
. . . pacing the industry with ever improving designs in high precision machine tools to give you faster, more accurate, more profitable production.

1955



A machine designed for today's production schedules — *and tomorrow's!* It's one of a whole new line of extra-heavy duty Warner & Swasey Turret Lathes — engineered to provide new power, more usable cutting speeds, automatic speed changes and simplified controls, plus traditional Warner & Swasey accuracy and dependability!

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY


SADDLE TYPE TURRET LATHES
Heavy Duty
1-A UNIVERSAL
2½" or 3" Bar Capacity — 16¼" Swing
2-A UNIVERSAL
3½" Bar Capacity — 20" Swing
3-A UNIVERSAL
4½" or 6" Bar Capacity — 23½" Swing
4-A UNIVERSAL
8" 9" or 12" Bar Capacity — 28¼" Swing
RAM TYPE TURRET LATHES
NO. 2 ALL-GEARED HEAD
1" Bar Capacity — 14" Swing
NO. 3 UNIVERSAL
1½" Bar Capacity — 15⅜" Swing
NO. 4 UNIVERSAL
2" Bar Capacity — 18⅛" Swing
NO. 5 UNIVERSAL
2½" Bar Capacity — 20" Swing
SADDLE TYPE TURRET LATHES
Extra Heavy Duty
1-A UNIVERSAL
2½" or 3" Bar Capacity — 16¼" Swing
2-A UNIVERSAL
3½" or 4½" Bar Capacity — 20" Swing
3-A UNIVERSAL
4½" or 6" Bar Capacity — 23½" Swing
4-A UNIVERSAL
9" or 12" Bar Capacity — 28¼" Swing

TODAY...an extensive line of cost-cutting machine tools in a complete range of sizes and capacities . . . each model individually designed and built for a specific range of work.

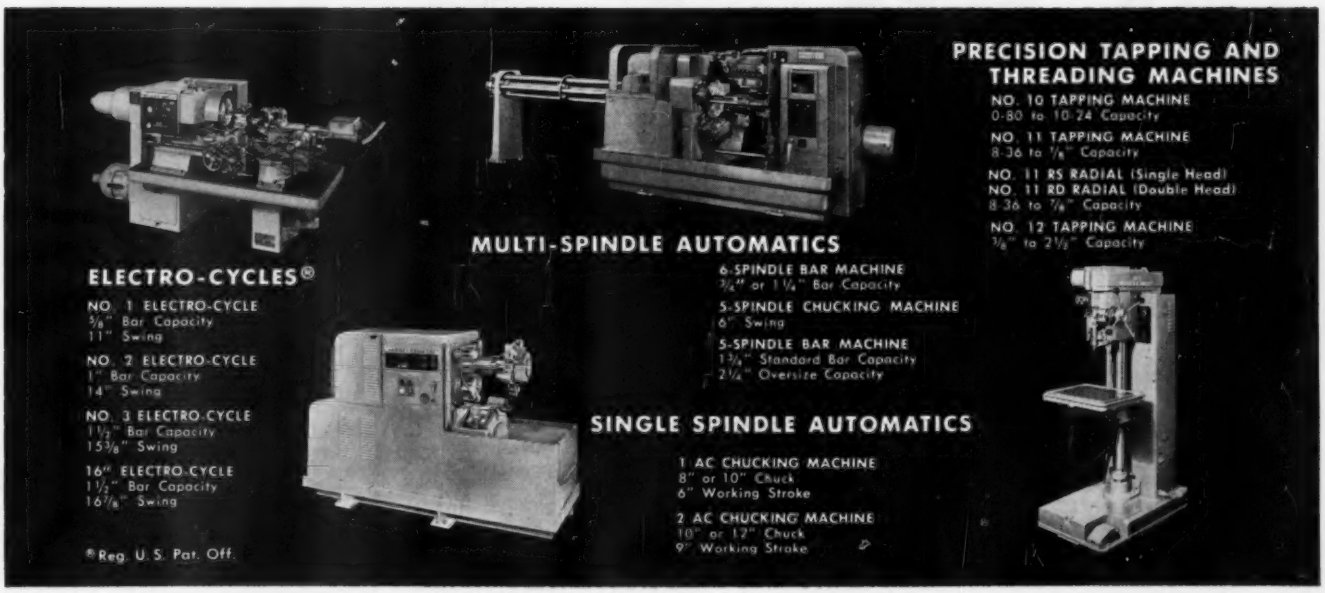
75TH ANNIVERSARY YEAR

WARNER & SWASEY

Cleveland

PRECISION MACHINERY SINCE 1880

1880 — 1955



He Brings You Morse More Often...

News

Morse has always made the news in cutting tools, right from the first twist drill. Consistent improvements in design, production and service . . . and most recently the biggest tap news ever headlined: The exclusive Morse "Vectormatic" Ground Taps that are ground to closer tolerances than can be held under now obsolete grinding methods. *So now you can have ultra-precision taps at commercial prices.*

And all these newsworthy developments are brought to you immediately by your Morse-Franchised Distributor . . . to boost your production and cut your tool costs with more (and more accurate) holes per dollar. What's more, he has the practical know-how to apply the right Morse Tools to your cutting operations, and get you the top return for your investment.

So get in touch with your Morse-Franchised Distributor right away. He's the man everybody is looking for today . . . *the cost-cuttingest man in town!*

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

MORSE
Cutting Tools

. . . buy them by phone from your Morse-Franchised Distributor and save ordering time

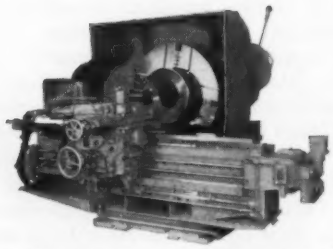
There's only one T lathe

...designed and perfected by Lodge & Shipley for ANY thin-wall, short length, large diameter work

Now used by scores of manufacturers in several countries, Lodge & Shipley T Lathes are setting notable records for productivity, accuracy and versatility. Particularly in the manufacture of jet engine parts and in other industry, T Lathes are solving the problem of facing, turning and boring thin-wall section work of large diameter and short length.

Far faster, more sensitive and much more accessible, T Lathes are more compact, cost far less than oversize lathes or boring mills formerly used.

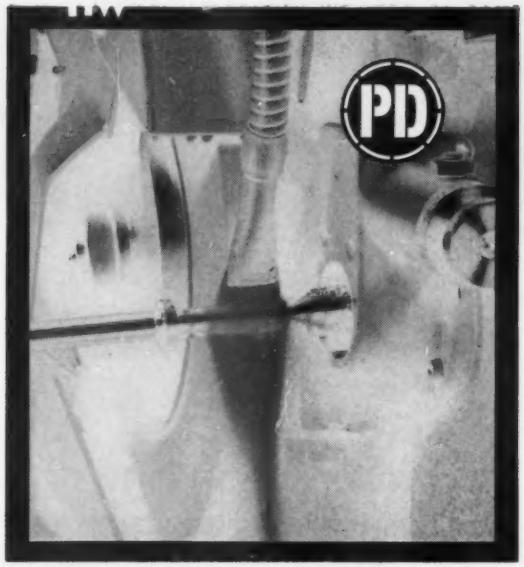
Like other manufacturers in many industries, you may find good profit possibilities in a Lodge & Shipley T Lathe. Write for Bulletin 215. The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.



Illustrated is the type O, the most universal single carriage type T lathe. Other types available with single or double carriages and with various Copymatic tracer control arrangements.

Lodge & Shipley

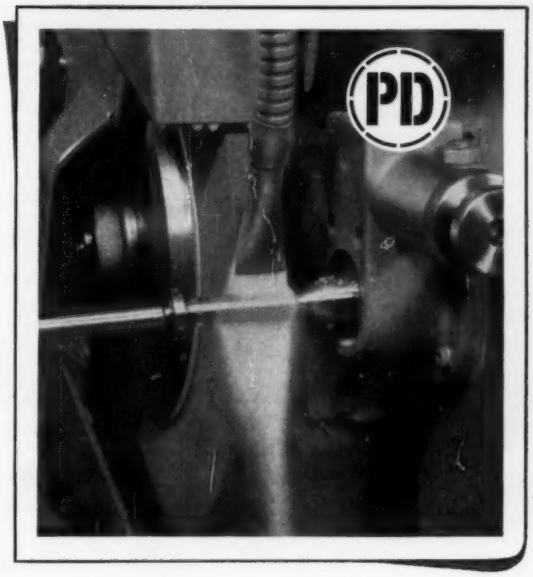
....your **LODGE**-*ical choice!*



Save money and increase production through this remarkable development..

JUST AS A NEGATIVE guarantees you an exact duplication of a photograph each and every time, you are always assured a . . .

. . . POSITIVE DUPLICATION of an original grinding wheel each and every time through the CINCINNATI (PD) Manufacturing Process.



NOW!

Cincinnati Grinding Wheels offer

PD Positive Duplication

Here is the most talked about advancement in grinding wheels in years. And no wonder! Positive Duplication is an outstanding achievement in precision manufacturing and quality control that absolutely can *save you money* . . . and *increase your production.*

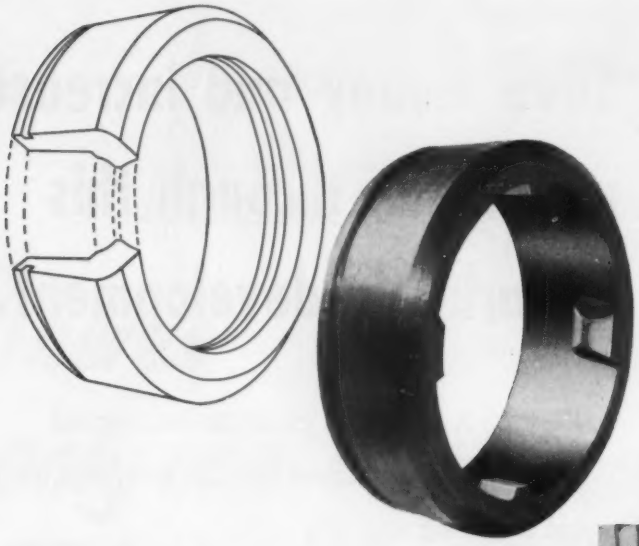
Through the CINCINNATI (PD) Manufacturing Process you are assured a Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

We'll be glad to prove to you how CINCINNATI (PD) WHEELS can save you money and increase your production. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

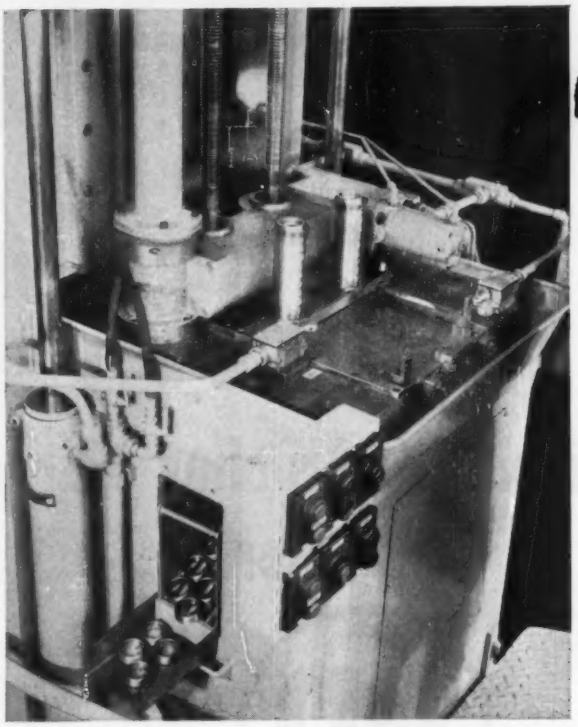
CINCINNATI
Grinding Wheels

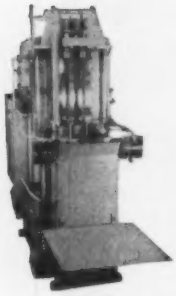
A PRODUCTION-PROVEN PRODUCT OF THE CINCINNATI MILLING MACHINE CO.



I. D. and four inverted helical splines BROACHED the American way

. . . 300 parts per hour





MACHINE
American two-station, pull-down broaching machine with spiral drive unit.

FIXTURES
American hydraulic slide unit with feed tubes and automatic clamping and ejection mechanism.

BROACHES
American combination round-and-spline broaches with helical spline teeth.

American engineering made this broaching operation fast, automatic and economical.

The finished inside diameter and four inverted helical splines are broached, in this automotive synchronizer ring, two at a time . . . 300 per hour.

American special combination round and spiral spline broaches are used to cut the splines concentric with the I.D.

The broach shanks are threaded through the rings, before they are clamped, in order to start the broaches through the parts, concentric with the holes.

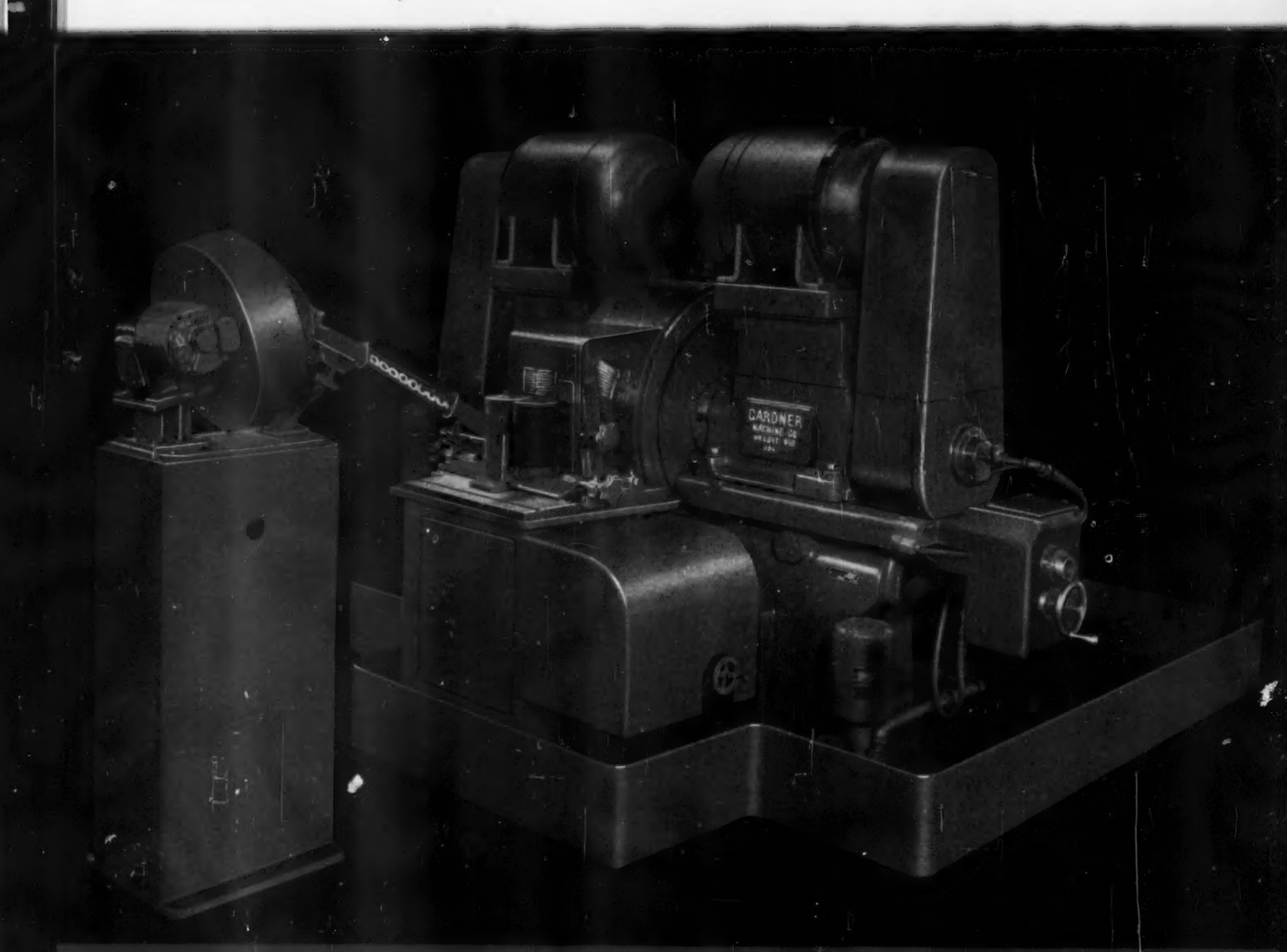
Feed tubes are here shown as manually loaded but are readily adapted to automation. Parts are fed and ejected by automatic hydraulic slides.

You may have parts that can be produced at significantly lower cost by broaching them the American way. Send part print or sample . . . American engineers will make a recommendation you'll find valuable.

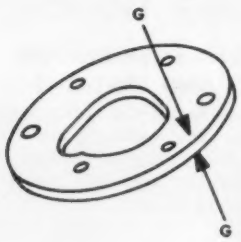
American Catalog 450 is a complete broaching manual . . . write for it today.

American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



Grinds 9000 Surfaces per Hour



TWO parallel sides of thin plates ground in ONE operation

Job Data	
MACHINE	Gardner No. 125-26" Double Spindle Grinder.
TOOLING	Motor-driven hopper feeder and power-operated feed-thru rolls.
PART	Aluminum time fuse plate.
PRODUCTION	4500 per hour, both sides.
STOCK REMOVAL	.015" overall.
TOLERANCES	.0003" to .0005" for parallelism; .0015" for uniformity.
ABRASIVES	2 Gardner Yellow-Rim WIRE-LOKT Discs.

GARDNER

precision disc grinders

Beloit, Wisconsin, U. S. A.

139M

for all your general purpose control

General Electric—one source of supply

MAGNETIC CONTACTORS AND STARTERS

Select from a full line of open and enclosed devices—from fractional hp through 200 hp (600 volts, maximum). Available in every popular NEMA enclosure, including: general-purpose; semi-dust-tight; water-tight; dust-tight; explosion-proof; oil-immersed, corrosion-resistant; and JIC (automotive).

COMPLETE LINE OF MODIFICATIONS is offered on magnetic starters such as: push button or selector switch in cover, extra interlocks, third pole overload relays, separate a-c control circuit, and extra control relays.

1. **FULL-VOLTAGE MAGNETIC STARTERS** (CR7006) for squirrel-cage induction motors are available in size 00 to size 5 with bi-metallic overload protection.
2. **REVERSING CONTROLLER** (CR7009) combines two standard magnetic starters and mechanical interlock.
3. **MULTI-SPEED CONTROLLER** (CR7107) is ideal for full-voltage starting of 2-, 3-, or 4-speed squirrel-cage motors.
4. **COMBINATION STARTERS** (CR7008) provide disconnecting means and short-circuit protection by nonfusible or fusible disconnect, or circuit breaker.
5. **CONTACTORS AND MULTI-CIRCUIT CONTROL RELAYS** (CR2810 and CR2820) will handle loads from 5 to 240 amps.

PUSH BUTTONS, SELECTOR SWITCHES, INDICATING LIGHTS

STANDARD-DUTY PUSH-BUTTON STATIONS

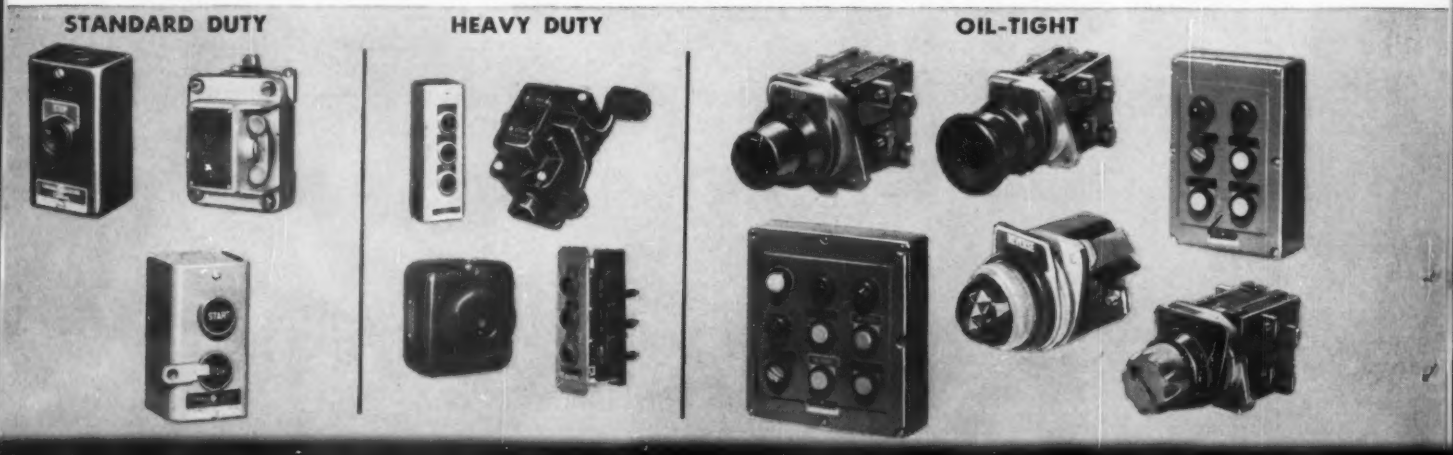
(CR2943). Stations are available with 1, 2, or 3 buttons and in pendant form. Double-break silver contacts assure reliable operation. Units are back-mounted on cover and need not be removed for wiring.

HEAVY-DUTY PUSH-BUTTON STATIONS

(CR2940). Stations offer wide variety of 1- to 6-unit combinations of push buttons, selector switches, and indicating lights. Also furnished for flush mounting. Palm-, foot- and treadle-operated stations available.

OIL-TIGHT PUSH-BUTTON UNITS AND STATIONS

(CR2940). Units have building-block design permitting any combination of contact arrangements. Also available are indicating lights and selector switches. Enclosures accommodate 1 to 16 units.



for all your general-purpose control

MANUAL AND REDUCED VOLTAGE STARTERS

1. **FRACTIONAL HORSEPOWER MANUAL STARTERS** (CR1061) are small-size, across-the-line starters operated by toggle switch—includes accurate bi-metallic overload protection.

2. **MANUAL STARTER UP TO 7½ HP** (CR1062) has snap-action toggle switch or push-button operator which trips free on overload. Available in 2-, 3-, or 4-pole forms.

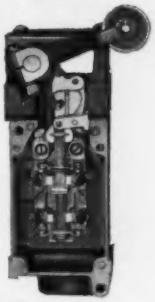
3. **MANUAL REDUCED-VOLTAGE STARTERS** (CR1034) are autotransformer types used where reduced starting currents or limited starting torques are needed. Undervoltage protection prevents automatic restart in event of power failure.

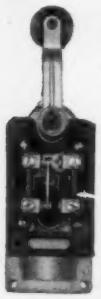
4. **MAGNETIC REDUCED-VOLTAGE STARTERS** (CR7051, CR7056) are autotransformer or resistor types designed for remote or automatic reduced-voltage starting. Timing relay provides proper timing for step-starting, eliminating excessive motor inrush currents.

LIMIT SWITCHES

LEVER OR ROTATING TYPE

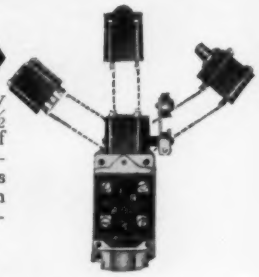
Double Circuit Lever Type (CR9440D). Snap action contacts can be changed from normally open to normally closed or vice versa. In open or oil-proof enclosed forms.

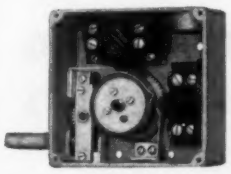




Snap-Action Lever Type (CR9440J). Used for heavy make-and-break requirements. Forms are available adjustable through 360 degrees. Operating lever firmly attached to shaft by double set of splines.

Small Snap-Action Oil-Tight (CR9440K). Only 1¼ and 1½ by 4½ inches. Oil-proof switch has 4 interchangeable heads that can face in any of four directions.





Rotating Cam Type (CR9441E) Two snap-action contact units operated through a worm gear reduction. Operating cams are easily set by adjusting only two screws.

General-Purpose Relay. (CR2790). For control circuit applications. Small in size with extremely long life. Rated 10 amps continuous (left).

Solenoids (CR9500). New strongbox solenoid provides firmly anchored terminal and lead-type connections in a single unit. 22% smaller units mount five different ways. Complete rating coverage in push and pull, 24 to 600 volts, 25 to 60 cycles and d-c (right).

Plugging Switch (CR2962). A pilot circuit device used in conjunction with reversing magnetic starter to automatically apply and remove plugging power for quick stopping of a motor.

Pressure Switches (CR2927). A pilot device used to handle small motors directly or in conjunction with a magnetic starter for starting and stopping pressure generating equipment.

Float Switches (CR2931). Used in conjunction with a magnetic starter to start and stop small a-c and d-c motors. Float and counterweight may be interchanged for tank or sump operation.

COMPLETELY NEW CATALOG OF G-E GENERAL-PURPOSE CONTROL

Advertising and Sales Promotion Section K

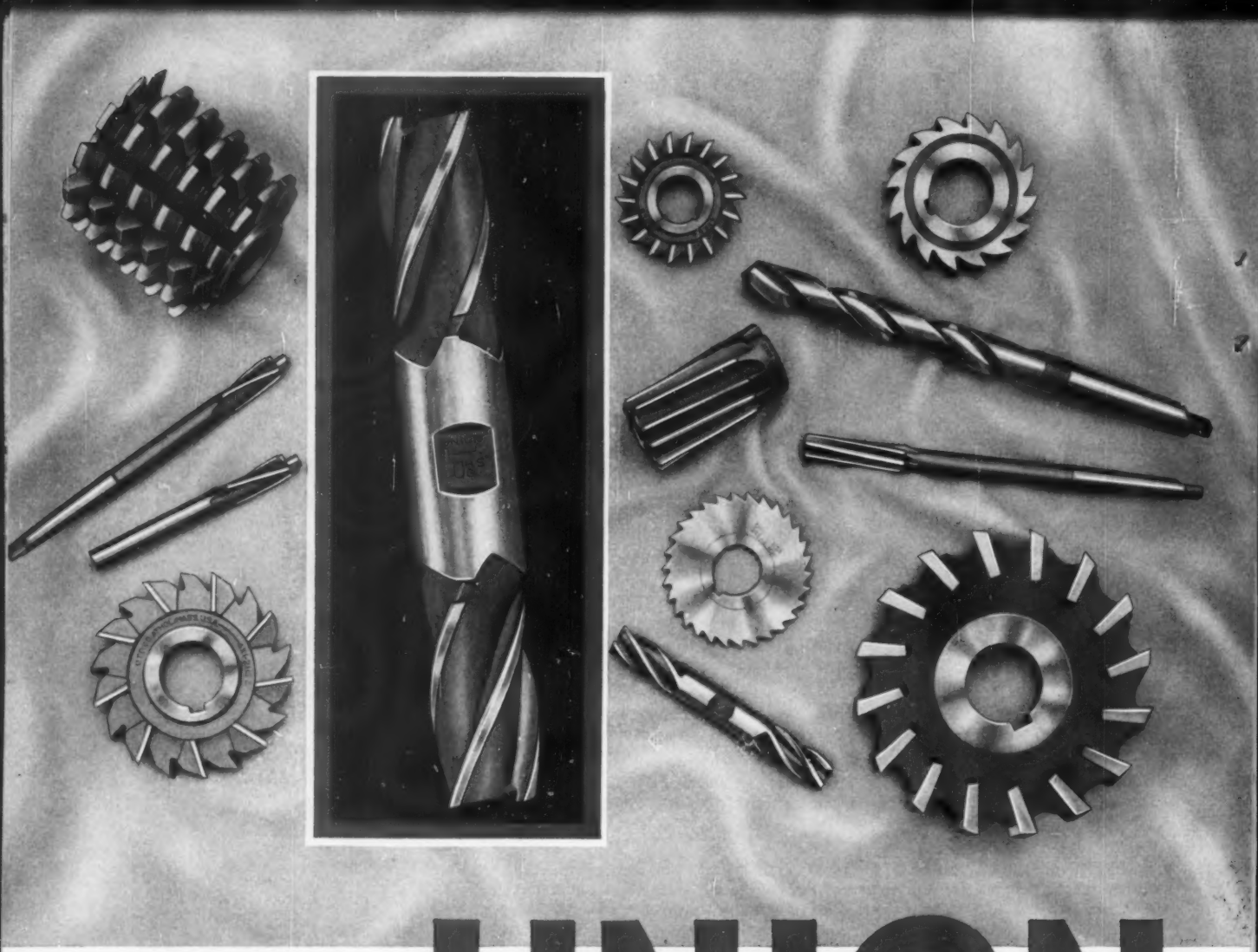
General Purpose Control Dept.
General Electric Company
Bloomington, Illinois

Please rush me a free copy of the new general-purpose control catalog, GEC-1260A.

Name .....
Title .....
Company .....
Address .....
City ..... **State** .....

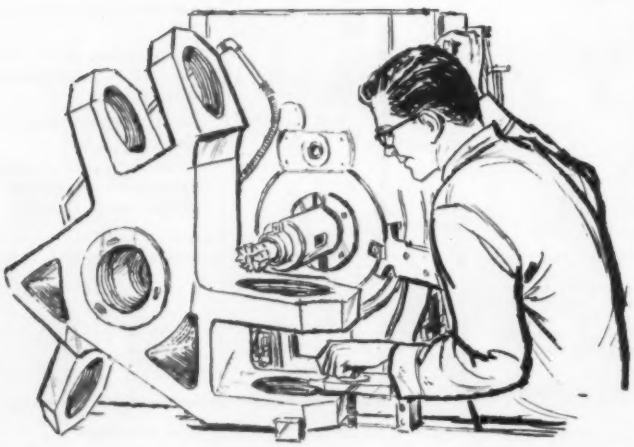
For more information on any of these general-purpose controls, contact your nearest G-E Apparatus Sales Office, or distributor.

GENERAL ELECTRIC



IN THE METAL WORKING INDUSTRY, IT'S

UNION



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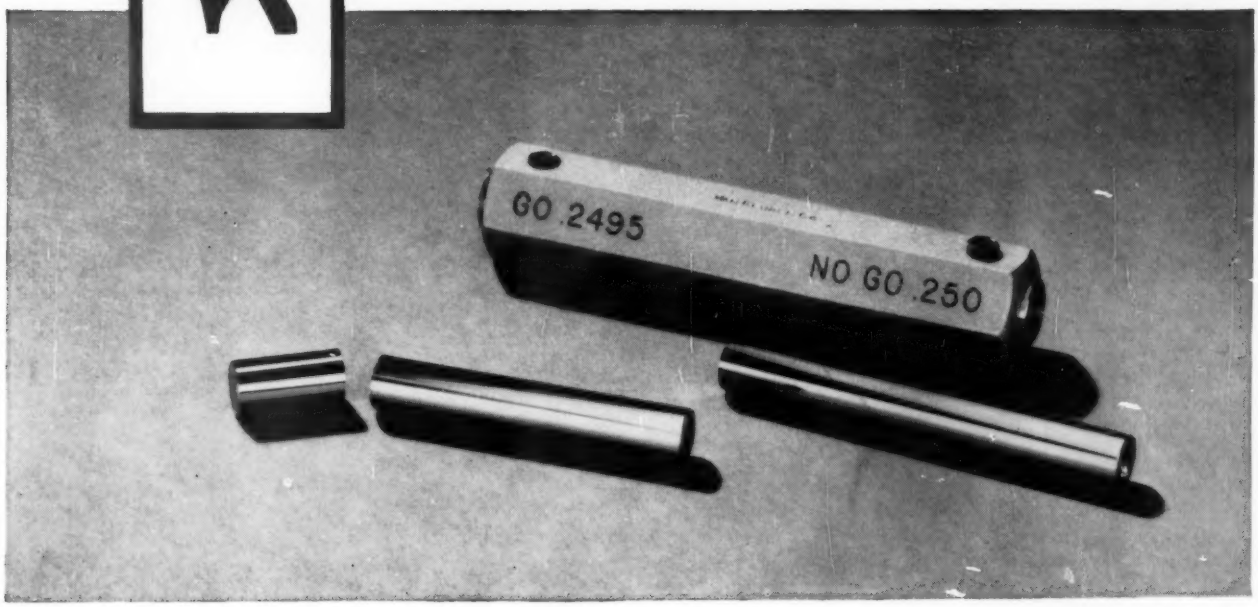
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

VK WIRE TYPE PLUG GAGES



VASTLY LONGER-LIVED *and* MONEY-SAVERS...

because they're "Cut-Off-Able" as well as "Reversible"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able." And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below 3/8" may be cut off when ends become worn and as many as from five to ten gages made available from the 1⅞" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible features.

VK Wire Type Gages are available in ZZ to XX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog & Hand Book No. 35, available on request by writing to The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

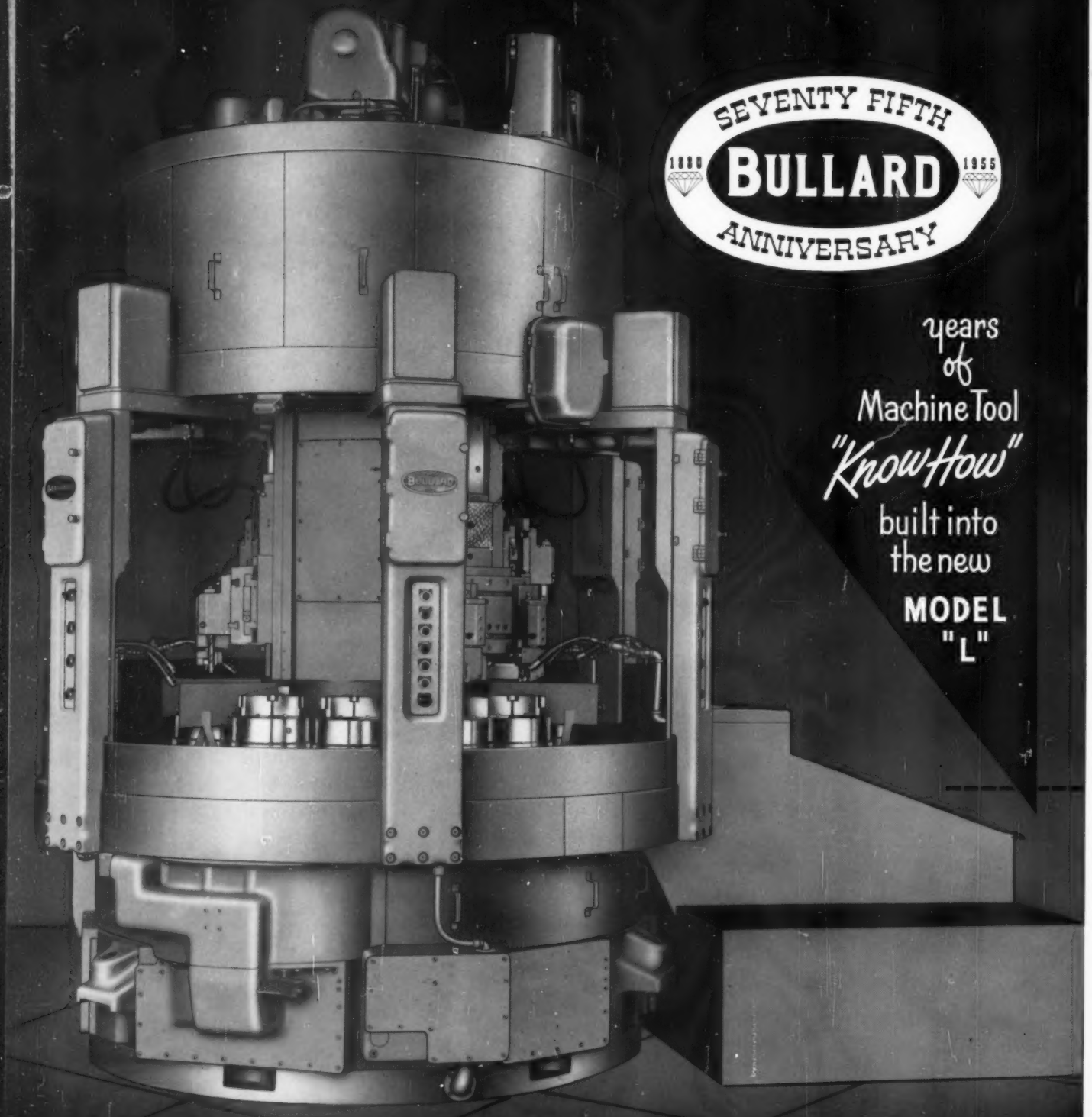
36th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

EVOLUTION of . . .



SEVENTY FIFTH
1880 BULLARD 1955
ANNIVERSARY

years
of
Machine Tool
"Know How"
built into
the new
MODEL
"L"

MULT-AU-MATIC TYPE "L"

Available in three sizes — 10" with 6, 8, 12 or 16 spindles, 14" and 18" with 6 or 8 spindles.

MULT-AU-MATIC PROGRESS

Since 1914 the Bullard Mult-Au-Matic has reflected engineering and design progress required to fulfill industry's needs – until today, the Type "L", is the optimum for machines of its type.

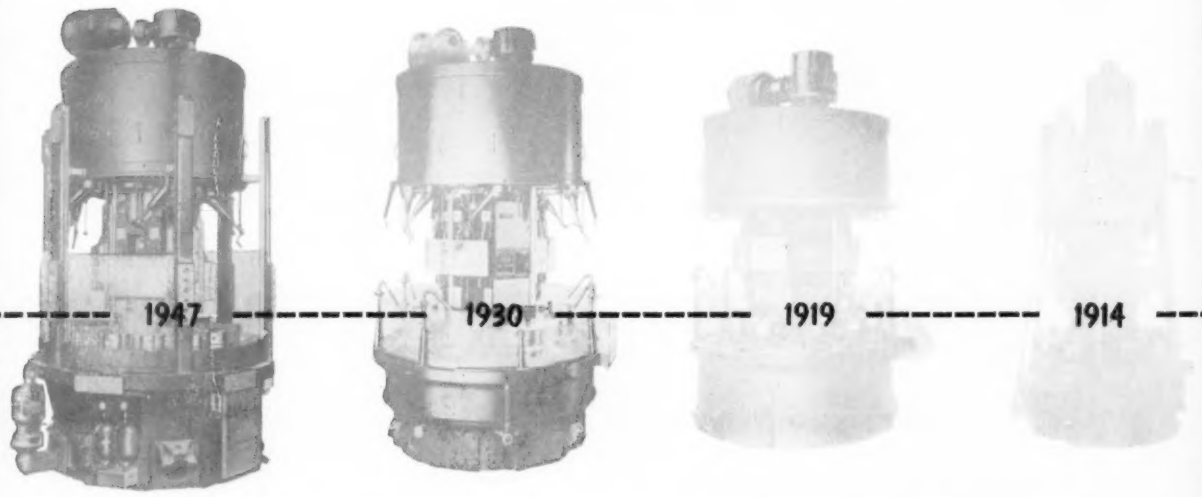
Here are some of its features:

CONTROL SYSTEM — Advanced design of electro-hydraulic controls provide a readily accessible and simple control system for both Set-Up and Automatic machine operation.

FEED MECHANISM — Completely new screw type feed works insures smooth constant rate of advance of tool slides through any desired part of a 16" stroke with 81 feed changes ranging from .0025 to .0625.

SELECTIVE SPINDLE SPEEDS — Range from 35 r.p.m. to 1,000 r.p.m. at each station providing the correct cutting speed to suit the specified operation.

CARRIER INDEX — The new indexing mechanism with improved carrier column bearing permits faster index of spindle carrier thereby reducing time between cuts. New design index mechanism registers and locks carrier, on successive indexes, to within ± .0005.



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BULLARD SALES OFFICE, DISTRIBUTOR OR . . .

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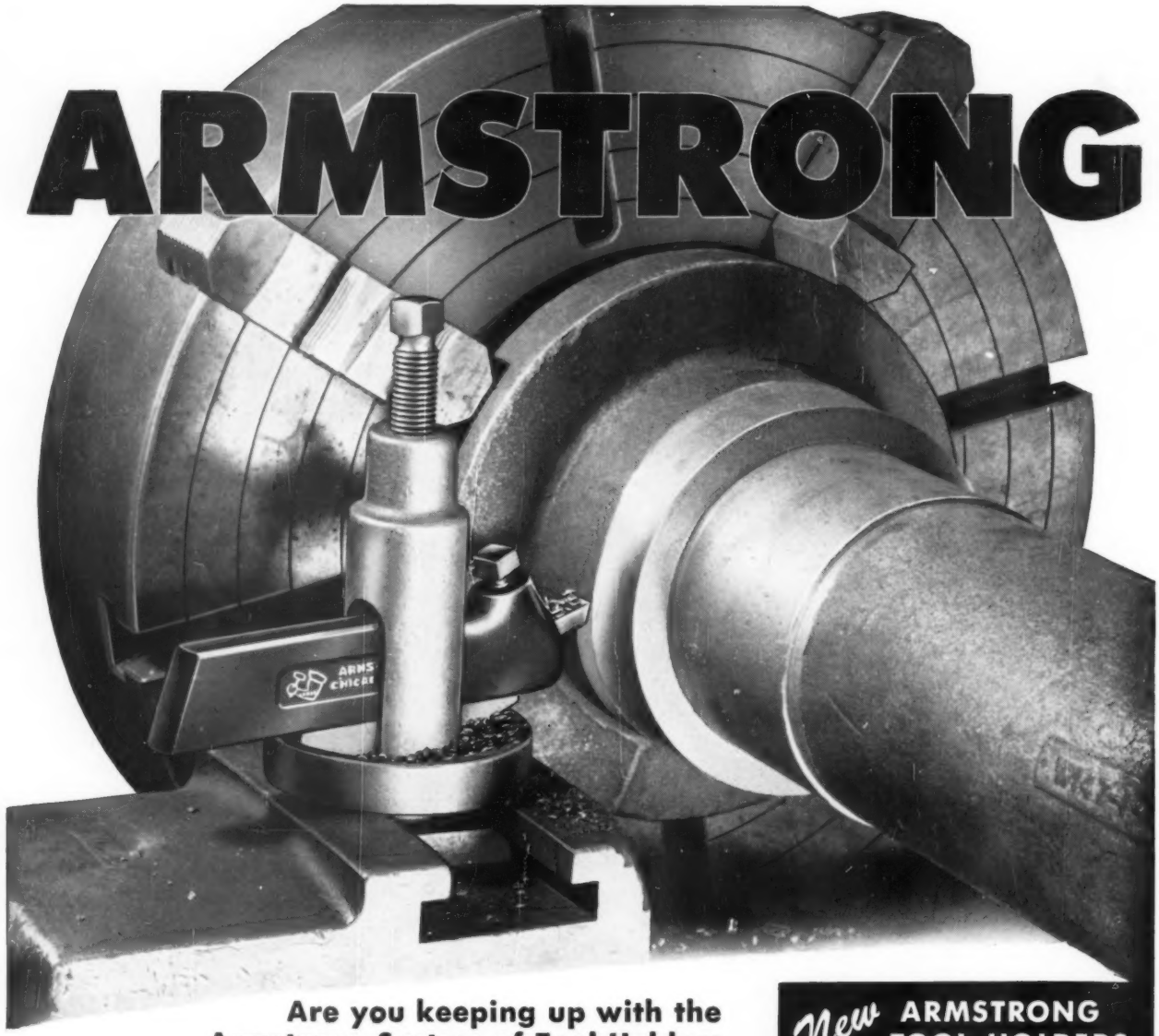
THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

WRITE FOR CATALOG

New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter-Bits

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

DENISON *MULTIPUMP*

VARIABLE VOLUME VANE PUMP

DENISON MULTIPUMP gives you variable volume at constant speed plus constant volume at variable speed

NEW, EXCLUSIVE MULTIPUMP PRINCIPLE makes possible great savings in horsepower . . . by delivering only the oil needed by the circuit.

SIMPLE, UNIVERSAL CONTROL—in one compact unit—combines features available in other pumps only as optional items . . . and, in most cases, MULTIPUMP eliminates circuit components usually needed in addition to the pump itself.

FINGER-TIP CONTROL. Simple hand dial adjusts volume. Volume is maintained by MULTIPUMP regardless of variations in pressure and pump speed.

and in addition...

PRESSURE COMPENSATED, easily adjusted. Can be remotely controlled. Can be vented.

OPERATES COOLER. New Denison design principle circulates oil from tank at all discharge rates, even when pump is compensated.

SEND FOR FACTS. Operating characteristics, sizes and capacities of Denison MULTIPUMP are given in Bulletin 190. Write

THE DENISON ENGINEERING COMPANY
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DENISON Hydr OIL ics

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

CASE HISTORY NO. 2—TORQUE CONVERTER HOUSINGS

MATTISON HIGH-POWER GRINDING METHODS

Open section made castings difficult to mill without springing ends. Two surfaces are now ground from the rough, holding flatness and parallelism within .0015".

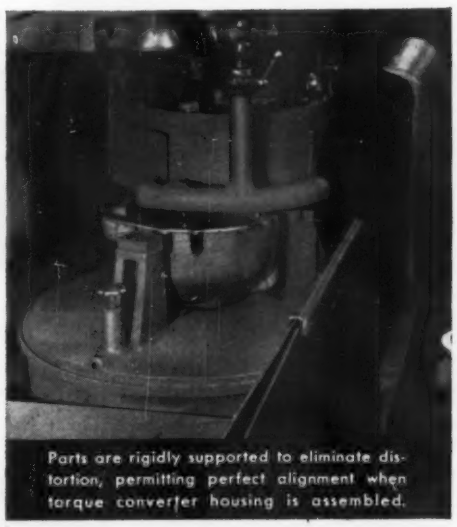
Courtesy—Studebaker-Packard Corporation

Saves two milling operations . . . finish grinding difficult-to-machine casting to close tolerance

How many facing operations in your shop can be done faster, better, and at lower cost on a Mattison High-Powered Duplex Surface Grinder?

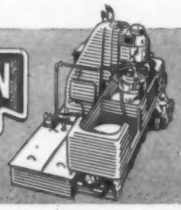
These grey iron castings, for example, were formerly milled (two cuts per surface) and then finish ground to required tolerance. Today, top and bottom surfaces are ground in one operation on a "Duplex Rotary" at the rate of 17.4 pieces per hour . . . removing .060" to .070" stock from each side . . . holding all surfaces flat and parallel within .0015" . . . *one* operator and *one* machine easily doing the work of *two!*

With two rotary tables, the Mattison "Duplex" eliminates downtime ordinarily required for cleaning and loading the table. Operator and machine are *both* more productive. This "all electric" machine is truly easy to operate . . . powered and rigidly built for heavy, multiple-pass grinding of small- or medium-size pieceparts. Why pay more for simple facing operations, or for grinding on a single-table machine, when the Mattison Duplex Rotary Surface Grinder can give you increased production, greater accuracy, and lower cost! Write for Bulletin No. 145.

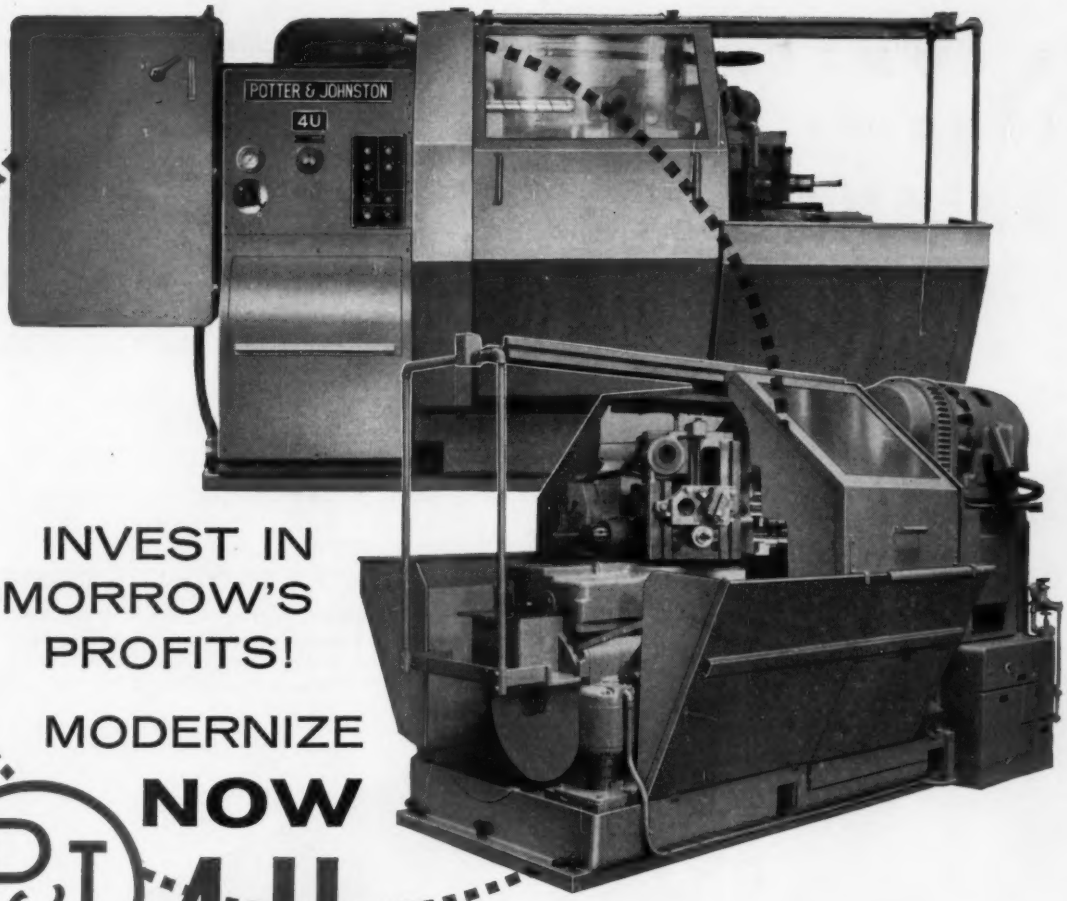


Parts are rigidly supported to eliminate distortion, permitting perfect alignment when torque converter housing is assembled.

MATTISON MACHINE WORKS ROCKFORD ILL. U.S.A.



HIGH-POWERED SURFACE GRINDERS



INVEST IN TOMORROW'S PROFITS!

MODERNIZE NOW

THE P&J 4-U AUTOMATIC TURRET LATHE

The Potter & Johnston 4-U Automatic Turret Lathe is designed and built SPECIFICALLY to handle today's tough alloys faster and more economically.

Check THESE 4-U PRODUCTION FEATURES

- **EXTRA SPEED and POWER** . . . 25 hp motor with all-clutch drive and spindle speeds to 1177 rpm takes full advantage of faster-cutting carbide tooling. On a recent job, a P&J 4-U consistently removed ***4 pounds of metal in just 30 seconds!***
- **GREATER RIGIDITY** . . . to maintain high precision and eliminate tool chatter under the heaviest cutting conditions.
- **UNUSUAL VERSATILITY** . . . independent front and rear cross slides, overhead pilot for added tool capacity, and many other features . . . plus expertly engineered P&J Tooling . . . means greater profits for a wide variety of work types and sizes.
- **FAST, SIMPLE SET-UP** . . . because ***all*** machine functions are controlled from a conveniently located, extra large dog drum.

POTTER & JOHNSTON CO.
PAWTUCKET, RHODE ISLAND
SUBSIDIARY OF
PRATT & WHITNEY
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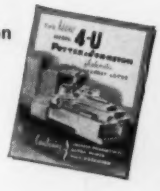
LET P&J SHOW YOU THE WAY

Send now for complete information on the 4-U and other P&J Automatics



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PRECISION PRODUCTION TOOLING P&J FOR MORE THAN FIFTY YEARS

A COMPLETE LINE OF

BALANCED Action TAPS

Any style or size tap you need—standard or special—will be a Balanced Action tap when you specify "WINTER."

And now—

Gages by WINTER

Plug and Ring, Threaded and Plain, with accuracy and long-wear built in by Balanced Action manufacturing methods.

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National

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH. U.S.A.

It's the Cutting Edges that Count!

It pays to use precisely designed and carefully made cutting tools: *Nationals:* Their cutting edges, famed for long life, give you smooth, trouble-free operation.

End Mills and other National tools are now available with **Carbide Tips**

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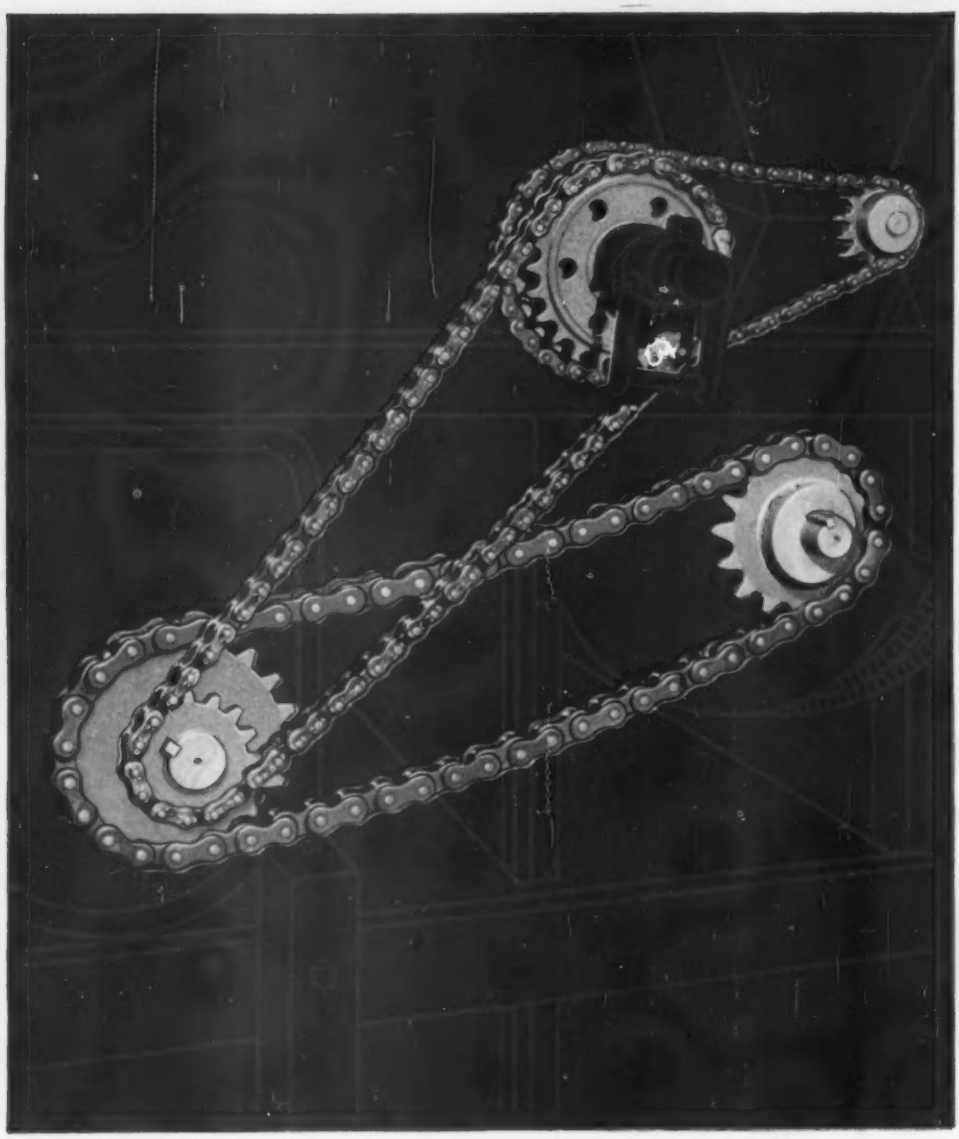
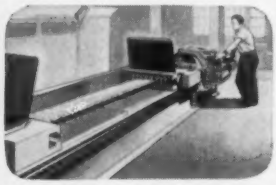
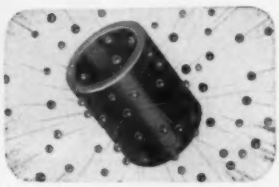
In roller chain . . . EXTRAS* like these give you extra reliability



LOCK-TYPE BUSHINGS (applied on a range of sizes) end a cause of stiff chain.



PRE-STRESSING of multiple width chain provides uniform load distribution.



SHOT-PEENED ROLLERS have greater fatigue life, added ability to withstand impact.

CLOSER HEAT-TREAT CONTROL — coupled with rigid testing insures uniformity.

*And you pay no premium for these LINK-BELT extras

BIG reason why Link-Belt Precision Steel Roller Chain is first choice for so many tough jobs is that it has *extra reliability built-in.* For example, pre-stressing smooths out any irregularities of multiple width chain *in advance.* And it's just one of many *extras* you get as *standard* from Link-Belt. Check the three others shown here. Then call the Link-Belt office or authorized stock carrying distributor near you for facts on Link-Belt's complete range of roller chain and sprockets. Data Book 2457 gives full information on single and multiple widths, in ¼″ to 3″ pitch, 1″ to 3″ double pitch. Ask for your copy.

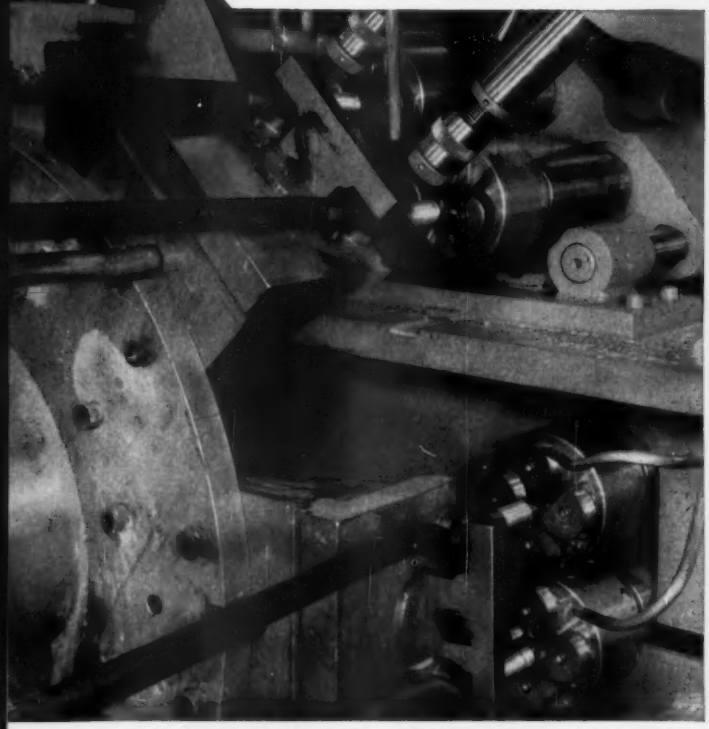
LINK-BELT

ROLLER CHAIN & SPROCKETS

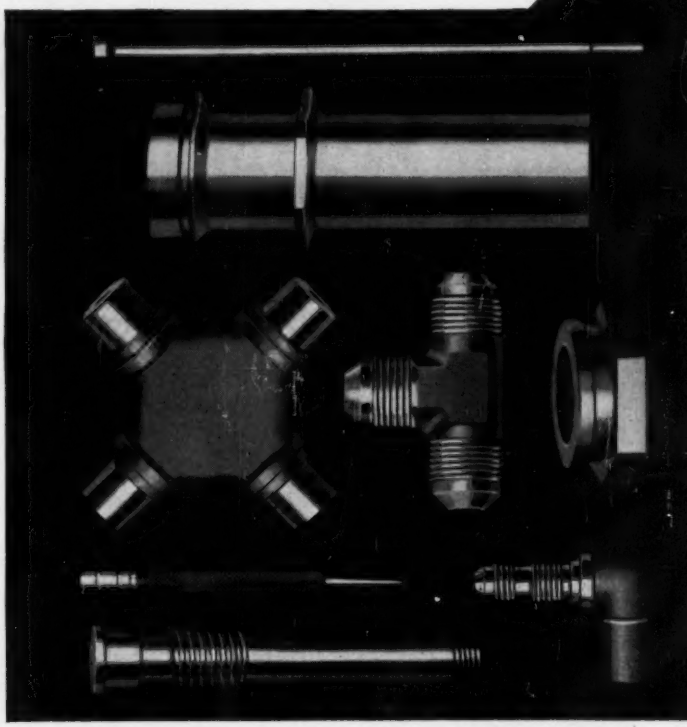
13,702

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Austria, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

for hollow milling . . . end forming and turning . . . for knurling, burnishing or threading—on short or long runs



On this Cleveland tapping machine, two Namco Vers-o-tools with circular hollow milling cutters prepare these forged steel rods for threading in the next station where two Vers-o-tools are equipped with circular ground thread chasers.



To do threading and turning jobs like these and thousands of others, better and cheaper, investigate the Vers-o-tool system. Catalog DT-52 describes the method and shows the complete line. Our representative will give you the answers on your jobs.

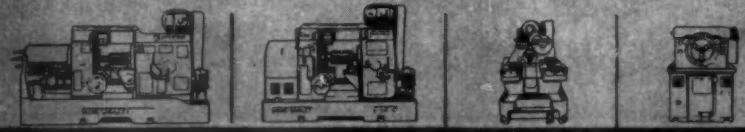
NAMCO VERS-O-TOOLS save time . . . tooling costs . . . additional grinding operations

Hollow milling, even to a very close micro finish, is three times faster with multi-cutter Vers-o-tool Heads than with single point tools. Knurling and burnishing jobs show similar time savings and accuracies. Threading also costs less per piece because with the Vers-o-tool "system" the guess-work is taken out of chaser grinding.

Further savings, too, in tool investment—chasers, cutters and rolls are interchangeable (size for size) in the same "double duty" Vers-o-tool heads.

24-hour deliveries on most standard stockable chasers and blocks—NC, NF, National taper pipe and Dry Seal.

SEE US AT THE MACHINE TOOL SHOW • SEPTEMBER 6 TO 17 • BOOTH NUMBERS 324 AND 708



OUR JOB: to provide the *Right Machine* for YOUR JOB

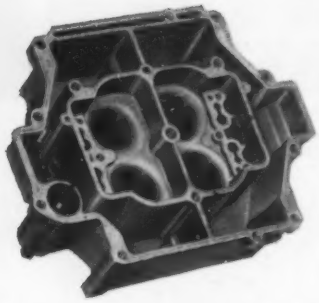
Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing

THE NATIONAL ACME COMPANY

171 EAST 131st STREET • CLEVELAND 8, OHIO

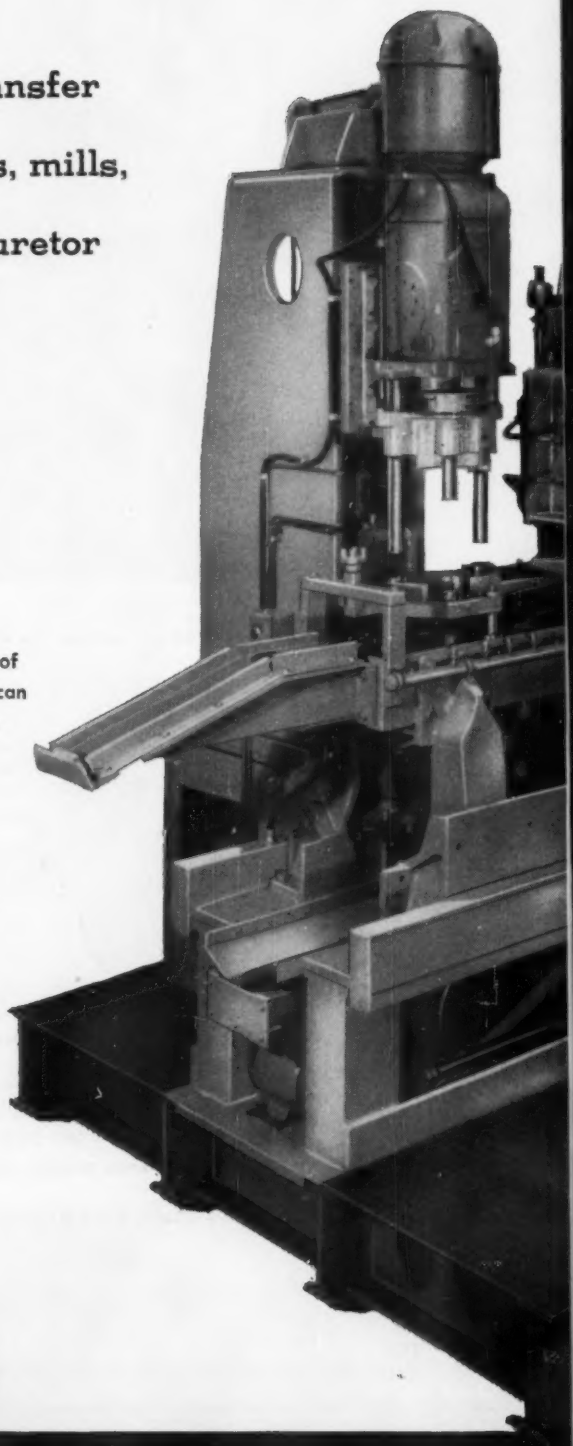
This is Automation . . .

Specifications: A 25-station in-line transfer machine which automatically drills, taps, mills, reams and burnishes one 4-barrel carburetor float-bowl, every 6 seconds!



The four-barrel float-bowl of a high performance carburetor produced by a leading automotive manufacturer.

Liberty has long enjoyed the privilege of developing special machines for American Industry. If you have a special machine problem, write to Liberty's Sales Engineering Department, *today!*



Liberty

TOOL and DIE CORPORATION

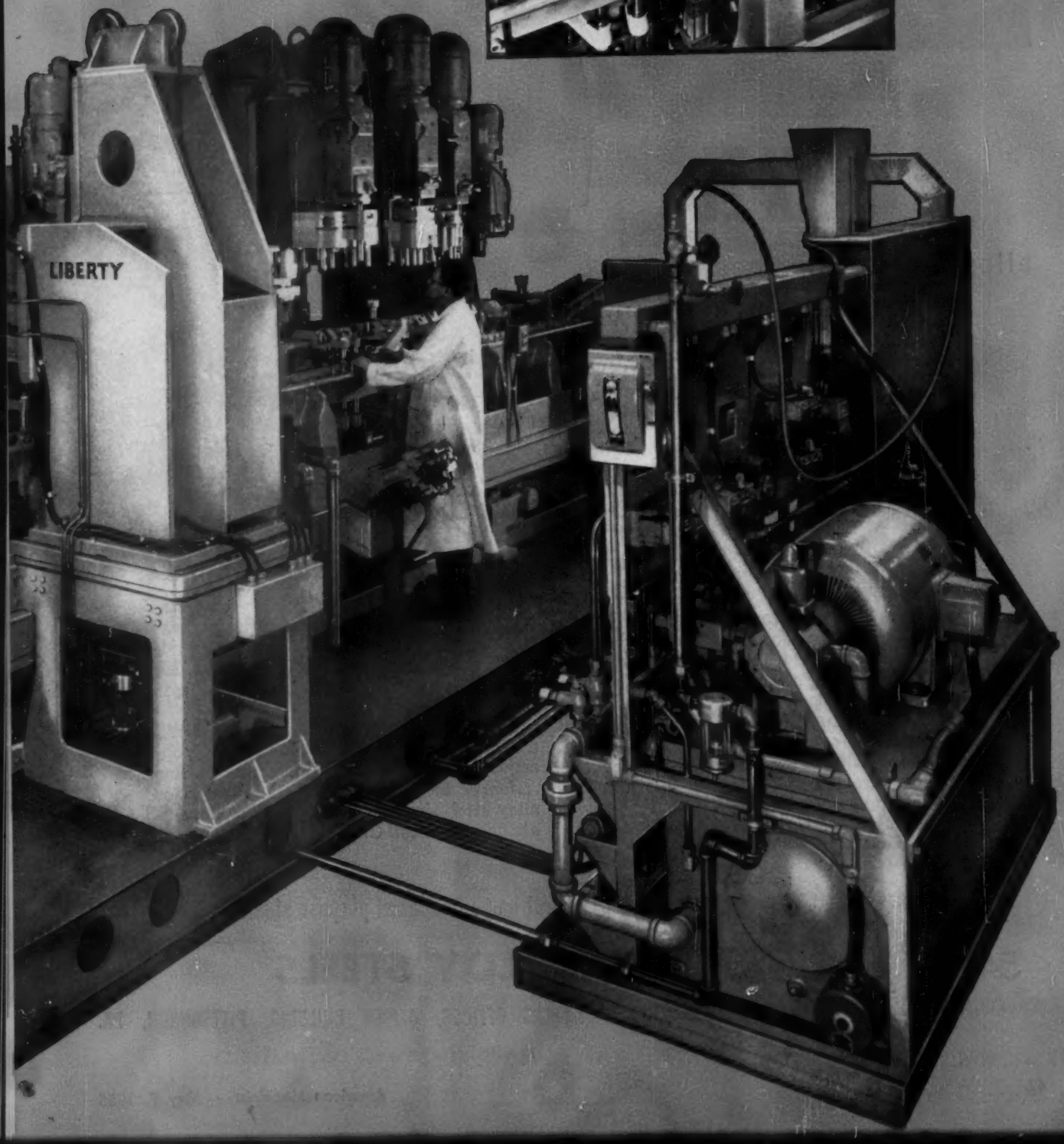
191 N. Water St. • Rochester 4, New York

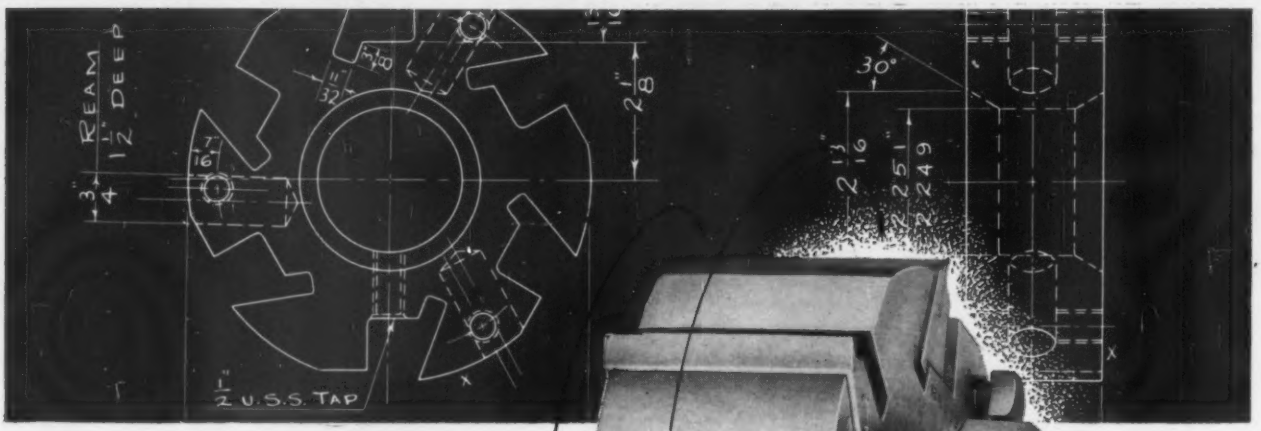
DESIGNERS AND BUILDERS OF TOOLS, DIES, AND SPECIAL MACHINERY

Solenoids • Contract Manufacturing

by Liberty!

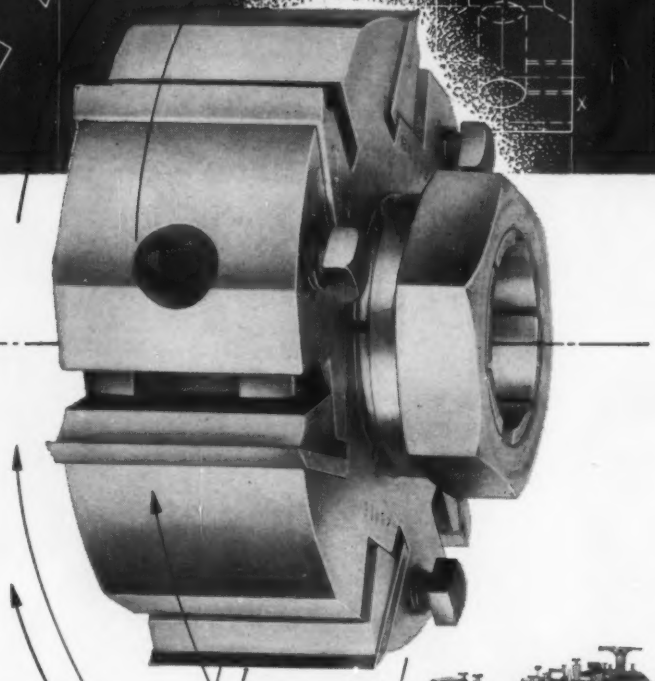
A close-up of two of the machining stations. Head on right is a 13-spindle tapping operation. Head on left is an 8-spindle burring, drilling, and reaming operation.

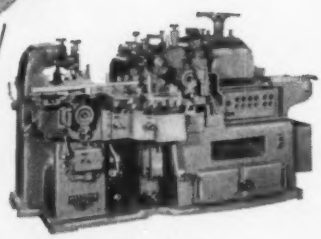




MAX-EL

alloy steel cutter head
for high-speed
electric moulder
finish-machined
after
heat treatment





You're looking at the "firing line" part of Mattison Machine Works' No. 276 High-Speed Electric Moulder. For this cutter head holds six knives that travel at up to 7200 rpm to do the machine's work of fast, vibration-free woodworking.

Hot-rolled Crucible MAX-EL® 3½ was chosen for this vital part. The forged and annealed MAX-EL blank is rough machined, then heat treated to 26-30 Rockwell "C" – *and then finish-machined.*

The remarkable machinability of MAX-EL after heat treatment...its dimensional stability...and its uniformity, which permits heat treating to a very close range of hardness – these characteristics make MAX-EL an ideal choice for vital machine components such as this cutter head.

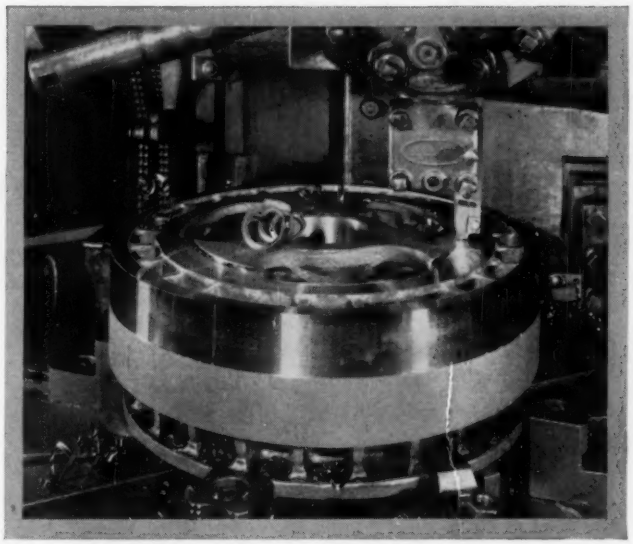
But try MAX-EL in your own shop. You'll see for yourself how these outstanding properties mean *faster* machining...*fewer* rejects ...*longer* tool life. On your next order for alloy steel – include MAX-EL. For immediate delivery – *call Crucible.*

CRUCIBLE first name in special purpose steels

54 *years of* Fine *steelmaking*

ALLOY STEELS

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.



FACING power shovel clutch and brake drum assembly with Grade 370 inserts cut over-all machining costs almost 70% for a Chicago mining machine manufacturer. Two Grade 370 clamp-on blanks replaced 16 tools.

SETUP: Material—1045 low carbon, high manganese cast steel, with hardness of 27 R_c. **Speed**—24 RPM. **Feed**—0.018-0.033 inch. **Depth of cut**—⅜ inch. **Coolant**—No.

all other steel-cutting carbides

Boost production as much as 366%; reduce downtime losses, tool costs

Hundreds of metalworking plants are now using Carboloy Grades 350 and 370 on their toughest steel-cutting jobs. And from plant after plant come reports of:

Reduced production time because Carboloy Series 300 carbides maintain efficiency at faster speeds, greater feeds, deeper cuts.

Reduced downtime because these new grades can take the punishment of high-speed machining . . . and stay on the job.

Reduced tool costs because Grades 350 and 370 take more regrinds; often eliminate rough finishing operations and tools.

Increased machine efficiency because Series 300 carbides have the strength and versatility to let you operate machines at upper performance limits.

The new, carefully controlled Carboloy process used in producing Series 300 imparts built-in structural rigidity *at the cutting edge*. Both Grade 350 and 370 can operate efficiently around 1800°F . . . a range where the cutting edges of other carbides deform, greatly reducing their effectiveness.

Your Authorized Carboloy Distributor can give you immediate delivery on Carboloy standard tools, inserts, and blanks in Grades 350 and 370 . . . in a wide range of sizes and styles. For the new Series 300 price list GT-305, send coupon on the next page, today.

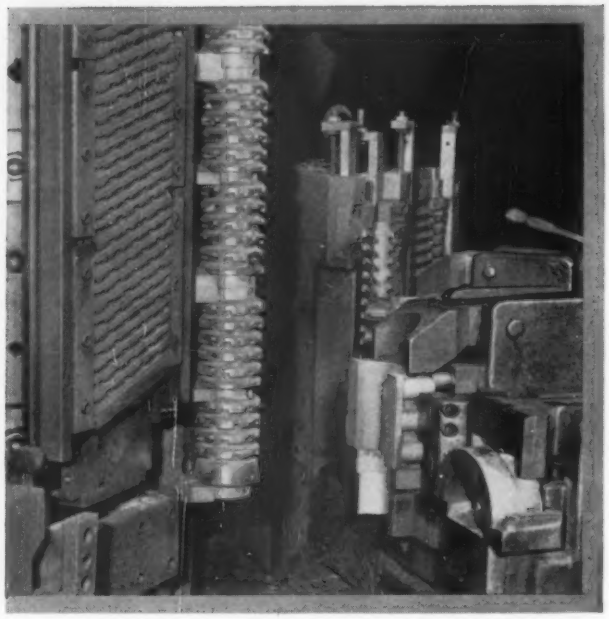
CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

OVER→

Carboloy Created-Metals for Industrial Progress

If you're machining cast iron, nonferrous metals, or plastics . . .

There's a Carboloy grade to fit your needs



BROACHING automobile bearing caps with Carboloy Grade 883 brought Studebaker a 22% saving in over-all costs. Carbide on previously used broach lasted a maximum of 24 hours; Grade 883 ran 50 days.

SETUP: Material—highly abrasive cast iron. **Speed**—28 SFPM. **Chip load per tooth**—0.005 inch for roughing; 0.0015 inch for finishing.

Carboloy tools, blanks, and inserts are available in many standard grades for machining cast iron, nonferrous materials, and plastics — as well as steel.

These grades are stocked in a wide range of sizes and styles by your Authorized Carboloy Distributor. He'll provide immediate local delivery to help you keep inventory costs down.

And your Distributor can give you expert assistance with any machining problem you may have . . . recommending the correct carbide grade and tooling method that best suits your particular job.

Send coupon, today, for price lists and specifications on Carboloy grades.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS

CARBOLOY
Department of General Electric Company
11149 E. 8 Mile Blvd., Detroit 32, Michigan

☐ Please send price list and specifications on steel-cutting Grades 350 and 370.

☐ Please send price list and specifications on other standard grades.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

AUTHORIZED CARBOLOY CEMENTED CARBIDE DISTRIBUTORS

See the Yellow Pages

. . . for the name of your local Authorized Carboloy Distributor. You'll find his name under the Carboloy trademark listing in classifications: TOOLS or TOOLMAKERS.

Morgan Engineering Co. now gets full efficiency from high-speed planer as...

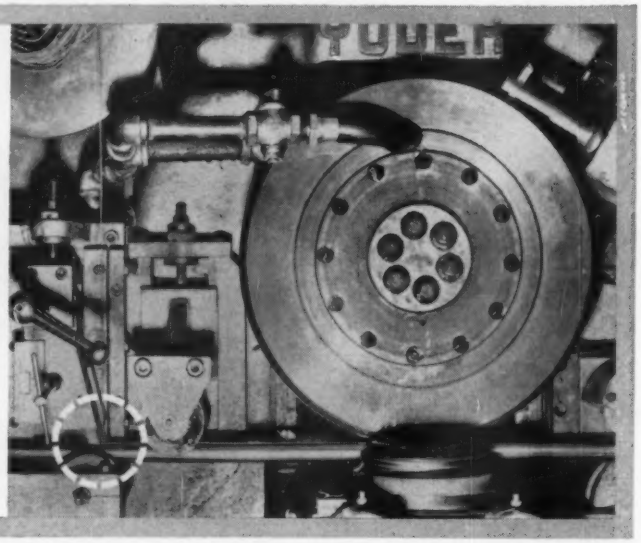
Carboloy Grade 370 carbide cuts production time 50% on steel-cutting "problem" job

Here's still more proof that there are no known "equivalent grades" for Carboloy® Series 300 carbides for medium- and heavy-duty steel-cutting:

PLANING CAST STEEL GEAR CASE. Long planer cuts on this 1-ton cast steel gear case cause thermal cracking in any carbide. Former tools had to be "babied along" to prevent excessive downtime for tool changes. Switching to Carboloy Grade 370, Morgan Engineering Co. now runs their high-speed planer four times faster . . . removing nearly 2000 cubic inches of metal before regrinding to eliminate thermal cracks. Production and tool life are doubled; machine efficiency is up 15%.

SETUP: Material—1-ton cast steel forging. **Speed**—160-180 SFPM. **Feed**—0.040-0.080 inch. **Depth of cut**—5/16-1/2 inch. **Coolant**—No.

Carboloy Grades 350 and 370 increase machine output, lower tool costs. Here's the complete story . . .

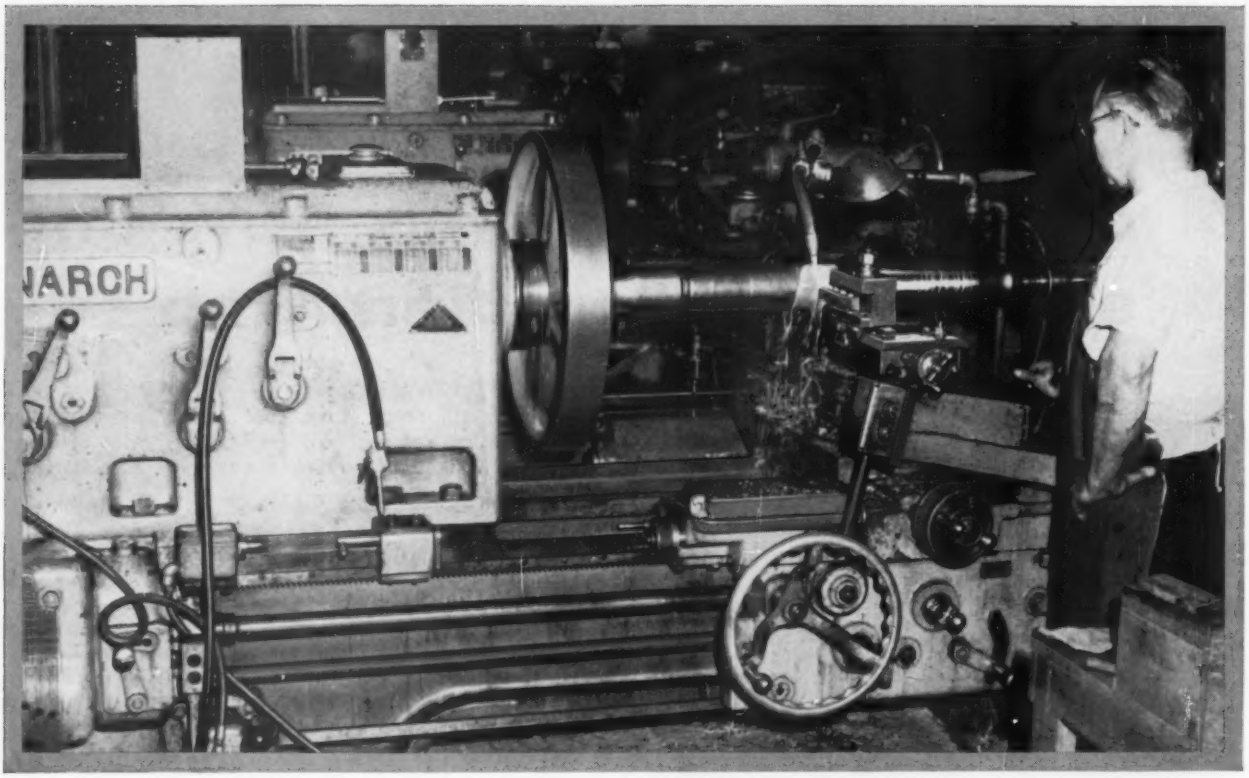


FLASH TRIMMING steel tubing at 2400°F ruined tools quickly at Bissell Carpet Sweeper Co., Grand Rapids, Mich. Switching to a standard Grade 370 tool eliminated costly special carbide tool; boosted production 14%. Line now operates full day without tool change.

SETUP: Material—cold-rolled steel. **Speed**—50-60 SFPM. **Coolant**—No.

Case histories prove there are no known "equivalent grades"—

Carboloy 350 and 370 outperform

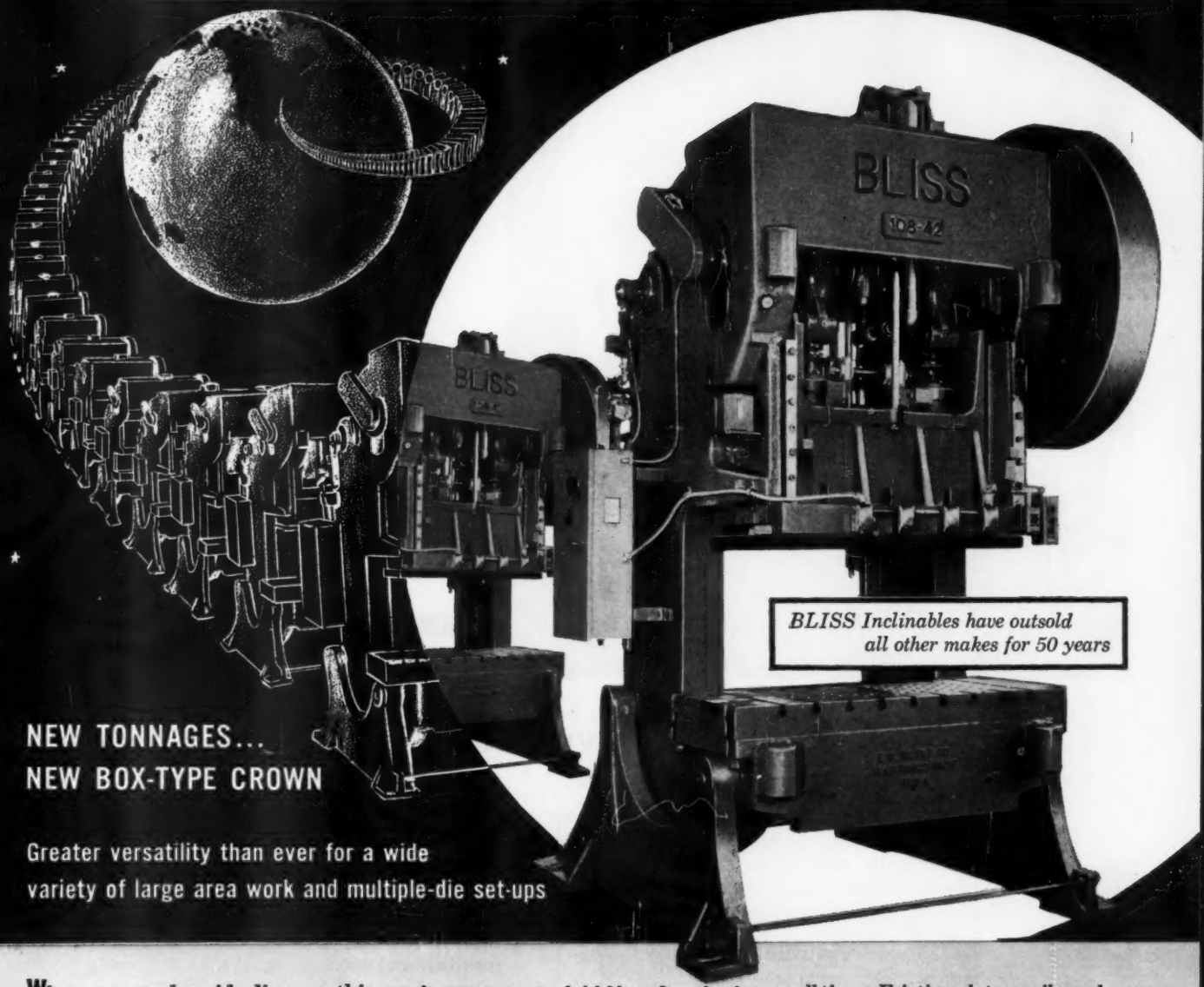


TURNING landing-gear piston with Grade 350 saved Menasco Mfg. Co., Burbank, Calif., ½ hour per shift in downtime. Other carbides produced 2 parts per grind at 125 SFPM; Grade 350 cuts at 185 SFPM with 6 times the production per grind.

SETUP: Material—4340 heat-treated forged steel. **Speed**—185 SFPM. **Feed**—0.010 inch. **Depth of cut**—0.060-0.200 inch. **Coolant**—Yes.

INTRODUCING BLISS' NEW

DOUBLE-CRANK INCLINABLE SERIES



BLISS Inclinables have outsold all other makes for 50 years

NEW TONNAGES...
NEW BOX-TYPE CROWN

Greater versatility than ever for a wide variety of large area work and multiple-die set-ups

When you need a wide die area, this is the press to handle tough blanking, forming, drawing, perforating.

Add a Bliss pneumatic cushion (the press is set up to receive it) and you extend the range of *draw* work.

For high production work, the addition of a Bliss feed (single or double roll, dial) will give you runs of 200 or more strokes per minute.

Improvements Add New Standards of Accuracy

- *New, Heavy Box-Type Crown*—the same as is used on rugged Bliss automotive presses—adds mass, rigidity ... minimizes deflection. Gives 100% up-snug bearing support. Adds strength through entire cast Meehanite gap frame. Keeps slide in perfect alignment even under unusual off-center loads.
- *Air Friction Clutch and Brake*—cool-running. Automatically adjusts for wear, making for fast action between full brake and engagement at all times. Friction plates easily replaceable without tearing down clutch.
- *Other Features*—Precision gibbing, roller bearings, extra-heavy ball-seat connections, heavy-duty forged shaft.
- *All Parts Available from Stock*—Parts are interchangeable and available from stock through any Bliss sales office.
- *Reasonably Priced*—Only Bliss offers a standard double-crank inclinable (to 161 tons) and with it offers the same low cost value as all Bliss Inclinables. Write for catalog and information about our Deferred Payment Plan.

E. W. BLISS COMPANY, CANTON, OHIO

BLISS *is more than a name... it's a guarantee*

Solve Your Inspection Taft-Peirce

No other air gage offers you the speed, range and versatility of a T-P CompAIRator. Look over these features and applications and see for yourself — then discuss your specific gaging problems with your Taft-Peirce sales engineer. He'll show you how to save time and money with Taft-Peirce CompAIRator Air Gages.

T-P COMPAIRATORS GIVE YOU THESE 5 ADVANTAGES

1. Instant Reading. No flutter . . . no creep . . . no appreciable time lag. Readings are virtually instantaneous even when extension hoses thirty feet long separate gaging member from CompAIRator.

2. More Versatile. No other air gage matches the accuracy over such a wide variety of applications . . . from simple diameters to simultaneous checks of such relationships as concentricity, squareness, and center distance.

3. Velocity-type Circuit. Venturi principle offers 3 advantages — accurate gaging of ID's as small as .055″ . . . magnification change simply by substituting one part and dial face . . . and linear readings.

4. Wider Tolerance Range. One basic CompAIRator with suitable gaging members and venturis, can check any specific tolerance range from .0001″ to .125″.

5. Gages Rough Surfaces. Contact type members allow precision gaging of parts with surface finishes beyond 50 micro-inches, rms . . . retain the self-positioning advantages of direct air gaging.

THE TAFT-PEIRCE

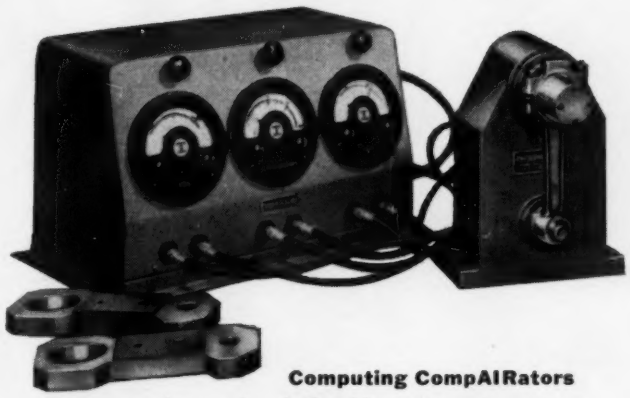
is more than a name... it's a guarantee

Problems by Air with CompAIRator Air Gages...

THERE'S A T-P COMPAIRATOR FOR EVERY INSPECTION NEED

CompAIRators

Available in single, double, or multi-dial units. Can be used with standard air plugs (for through-holes, counter-bores, or blind holes), air rings, and air snap gages — directly attached to cabinet, or to extension hose. Contact type members permit air gaging of rough surfaces. Special fixtures designed and built to order.

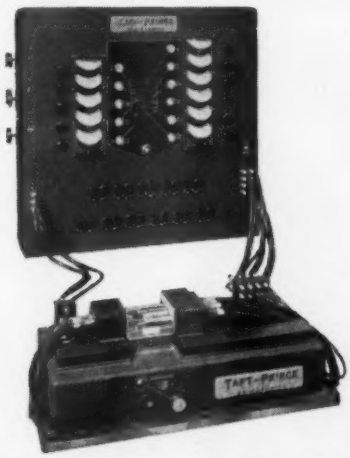


Computing CompAIRators

For measuring such relationships as squareness or center distance, a Computing CompAIRator eliminates making two separate measurements and a calculation. Does the whole job — measures, computes, and indicates the result instantly on a single dial. 3 dial unit above replaces 6 ordinary indicators.

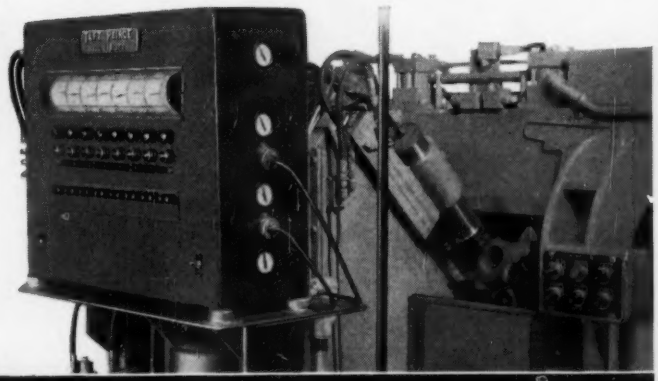
Air-Electric CompAIRators

For rapid inspection of a number of dimensions. Lights indicate any dimension out of tolerance. Exact reading can be then taken from proper dial face. Compact angular mounting of dials, either horizontally or vertically, speeds and simplifies reading.



Automatic CompAIRators

Easily incorporated into production lines where maximum speed of inspection is required. Automatically checks parts, rejects off-size work. Can be built directly into high production machine tools to actuate size control mechanism.



MANUFACTURING CO.

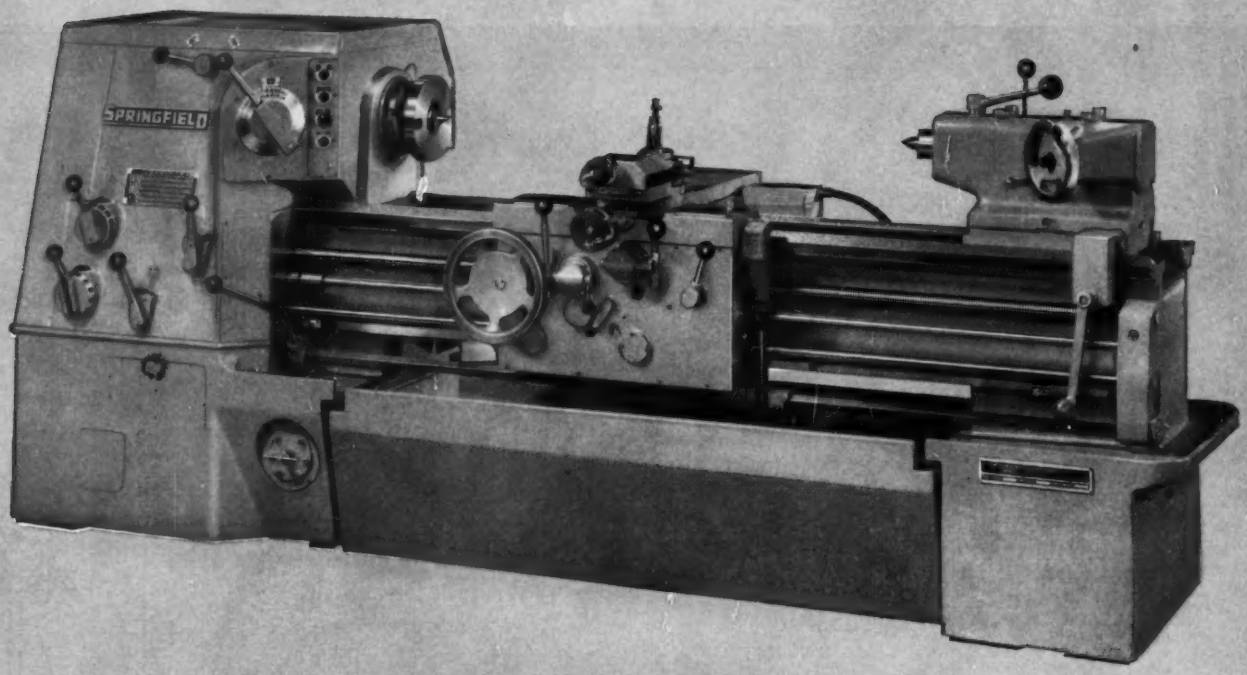
WOONSOCKET, RHODE ISLAND

T P

T-P means Top Precision

SPRINGFIELD

See Springfield at Booth 612, Machine Tool Show, Chicago, Sept. 6-17.



more useful horsepower

All the horsepower in a Springfield Model "S" Lathe is productive.
A simple, straight-forward gear train, plus double-action lubrication, plus tight dynamic balance tolerances (.0005" displacement) eliminate friction and vibration, the twin horsepower thieves.
In the headstock, only the gears necessary to a given speed are engaged. Other gears run free with a stabilizing flywheel action, no drag on power.
A high pressure filtered oil mist keeps all gears and bearings drenched, and a cascade of oil lubricates the feed box.

Lathes: Engine and tool room, contouring and reproducing—swings 14" to 32".
Vertical Universal Grinders: swings 18" to 42".

The Springfield Machine Tool Company
Springfield, Ohio

68TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

Springfield

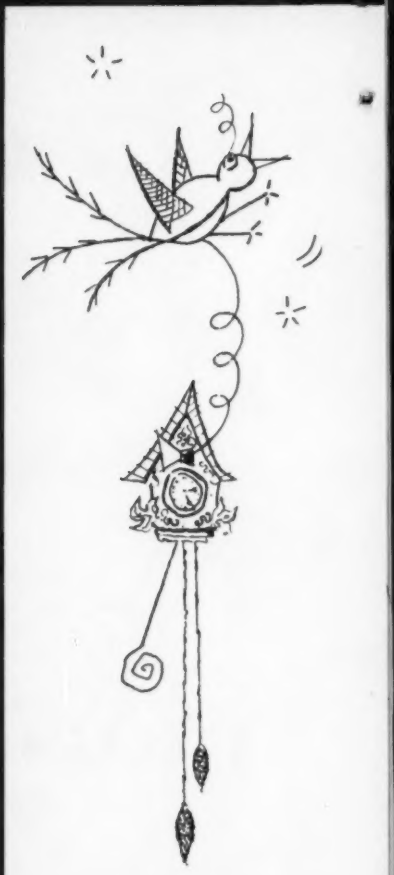
YOUR TURNING-TIME CONCEPTS

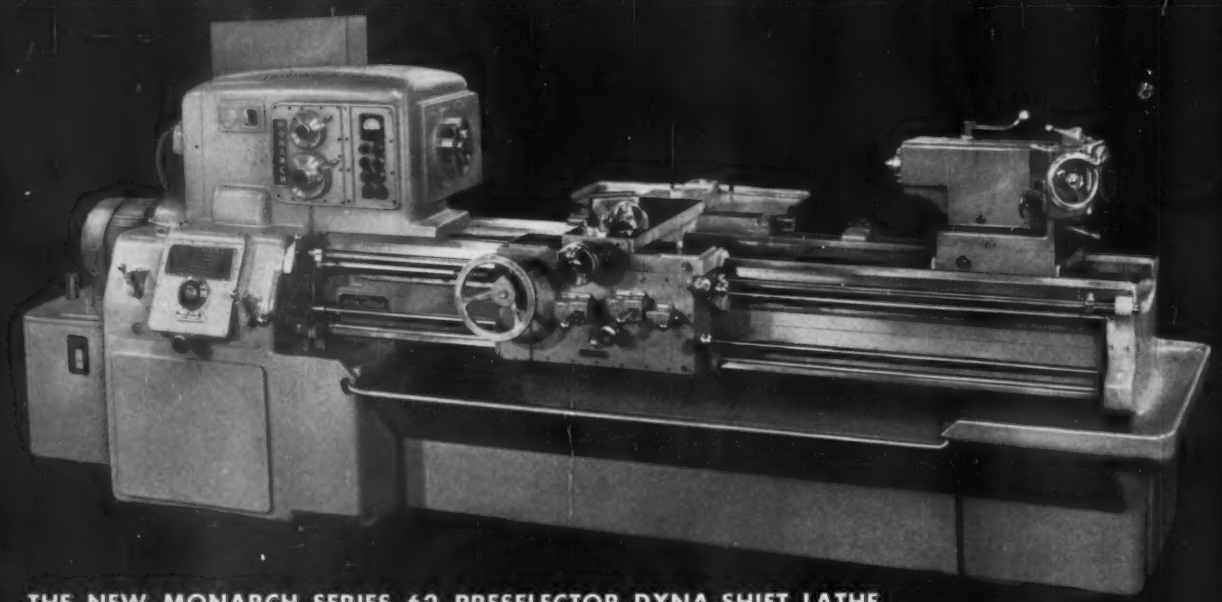
Set it—forget it! That's the story of the Preselector Dyna-Shift. It's the brain Monarch has built into the new Series 62. With it *this* machine will give a greater ratio of metal removing hours to work hours than you ever dreamed possible.

When setting up, merely dial the surface speed wanted and the first diameter to be turned—the Dyna-Shift computes the R.P.M. and makes the shift instantaneously and automatically. *(Time-saver #1).* Then, to maintain this surface speed on successive diameters, set the work diameter selectors. Every speed change thereafter, on *every* piece in the run, takes place automatically with but one fast dial setting and movement of the work start and stop lever. *(Time-saver #2).* What's more, here at last is the lathe with a speed range so wide as to take care of all your needs. Its 20 H.P. drive gives you 36 different spindle speeds in a range from 14 to 1750 R.P.M., a ratio of 1 to 125. *(Time-saver #3).*

Nor are the time-saving features of the Series 62 limited to the Preselector Dyna-Shift headstock. There's four-way power rapid traverse which cuts tool positioning time on the average of 50% There's the totally enclosed and automatically lubricated gear box and end gearing. There's a completely new two speed tailstock. Add them all up and you get a new lathe concept that means Production with a capital P!

You will want to know all about these and many other features in detail. Send the coupon for the greatest turning news in years!! . . **The Monarch Machine Tool Company, Sidney, Ohio.**



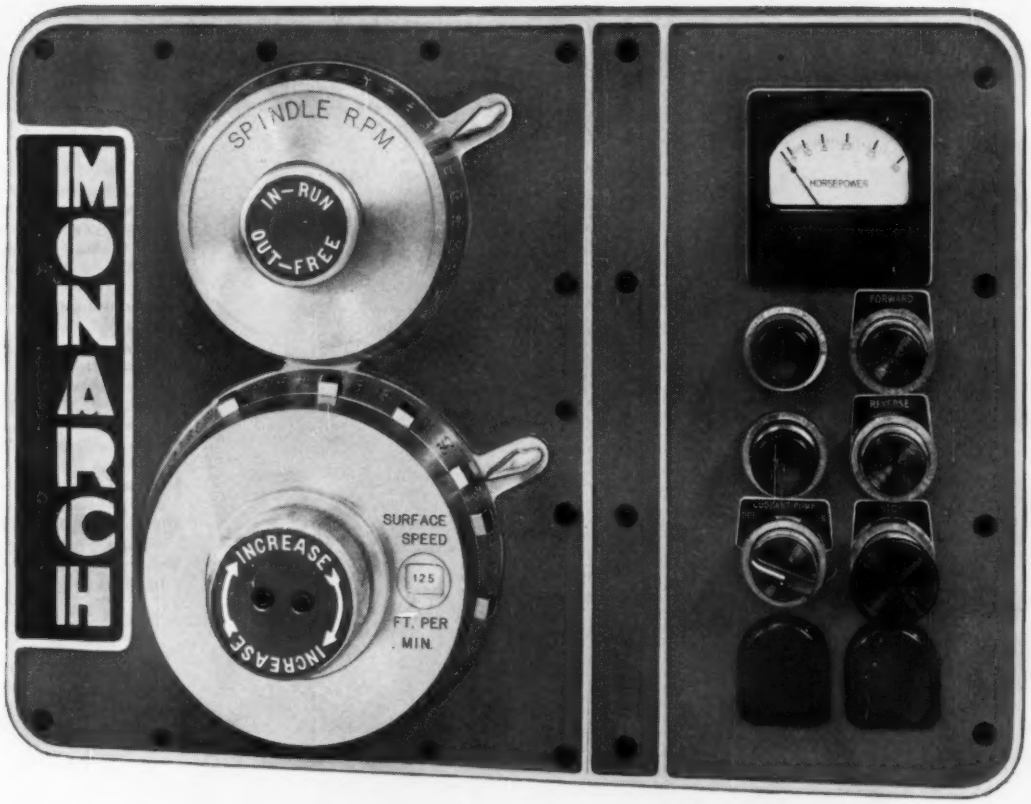


THE NEW MONARCH SERIES 62 PRESELECTOR DYNA-SHIFT LATHE

Models 130 and 1130 (above)—13" swing over cross slide, 20" clearance diameter.
Models 131 and 1131—16" swing over cross slide, 24" clearance diameter.

ARE IN FOR A SHOCK!

See the New Monarch Series 62 Preselector Dyna-Shift — — Unequaled for Speed and Ease



Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER ...TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen:

☐ I am interested in your Series 62 story. Please send me your illustrated Booklet #1501 with complete data.

☐ Please have a Monarch sales engineer call on me.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

FILL OUT COUPON—and attach to your business letterhead, please.

"Operations Kingsbury" includes straddle milling two

Front and rear hangers for an automobile front spring assembly are machined on these two Kingsburys. Design of each part requires work from three directions: top, front *and back*. This work is accomplished in one cycle without rotating the work-holding fixtures.

These two machines illustrate several important advantages, appreciated by design engineers and production men.

For example: high production at low cost per part. The following table tells this story:

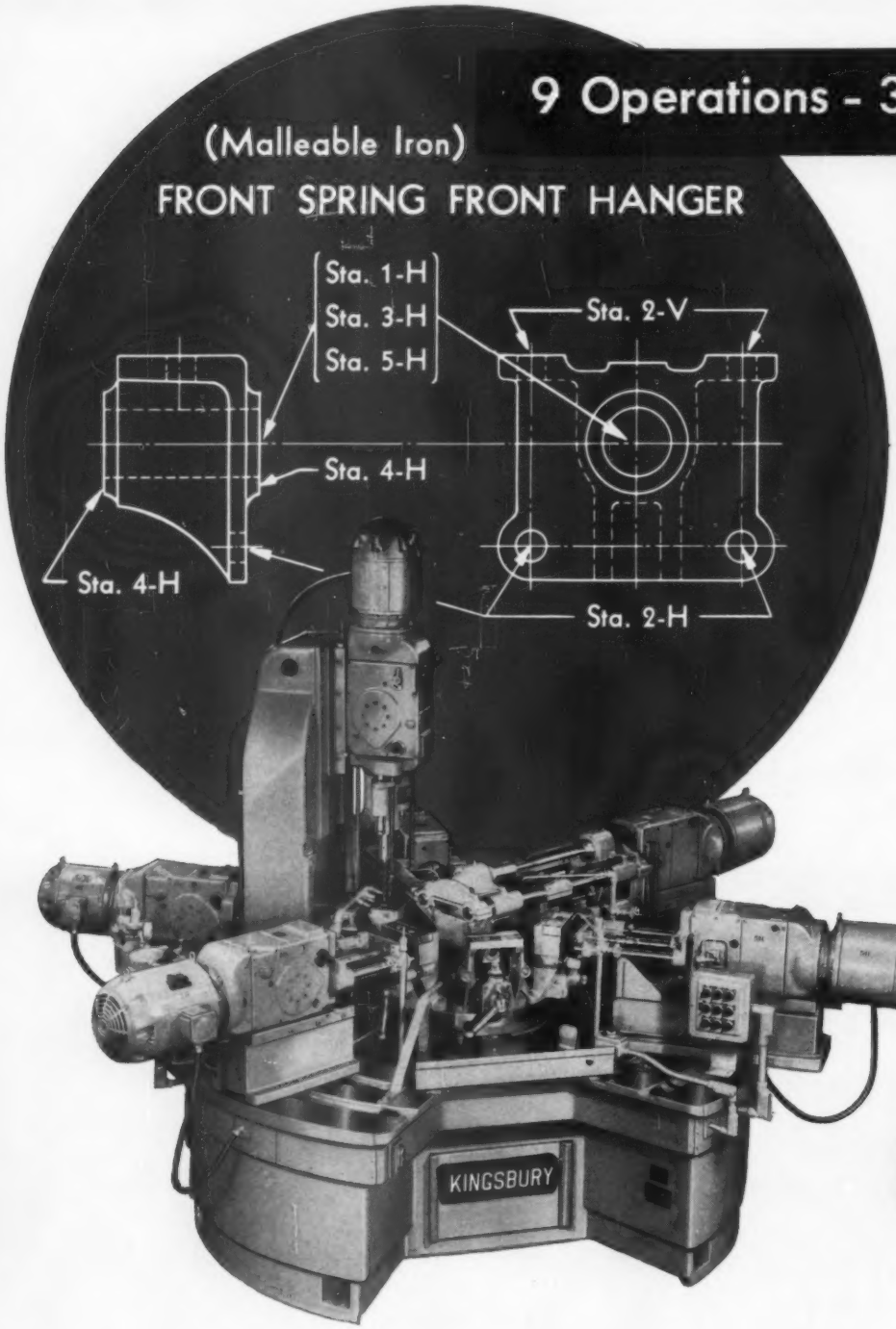
Part	Number of Operations	Parts per hour, gross	Cost per part
REAR HANGER (at right)	**10**	**240**	**4-6/10c .**
FRONT HANGER (at left)	**9**	**265**	**3-6/10c**

REAR HANGER: Two milling operations for only 1c.

9 Operations - 3 6/10 ¢ per part

(Malleable Iron)

FRONT SPRING FRONT HANGER



This Kingsbury machine has a 96-inch base and 26-inch index table. Six work units are mounted on the base. Six work-holding fixtures are mounted on the table, which indexes through six-stations (one for loading and unloading). All work is performed at five stations, without removing the part from the fixture.

Work	*Operations*
Station 1-H: Core drill .853/.855 hole undersize	1
Station 2-H: Drill .375 thru — two holes	2
Station 2-V: Drill .375 thru — two holes	2
Station 3-H: Rough ream .853/.855 hole undersize	1
Station 4-H: Spotface bosses 1.25 dia., front and rear	2
Station 5-H: Finish ream .853/.855 hole thru to size	1
Total Operations	9

KINGSBURY

bosses for approximately one cent

There's nothing particularly difficult about any of these operations — until we consider the production output and low cost per part. Even at 80% efficiency, delivery of a finished part such as these *every* 19 *seconds* or less, is profitable business for the manufacturer.

Today, the design engineer has greater freedom than ever before. He can now design parts with less worry about *manufacturing* operations . . . because, here at Kingsbury we know what operations a Kingsbury *can* do. So, if we feel that a Kingsbury machine will justify itself in your production schedule, you can plan on high production, low cost per part, and uniform quality.

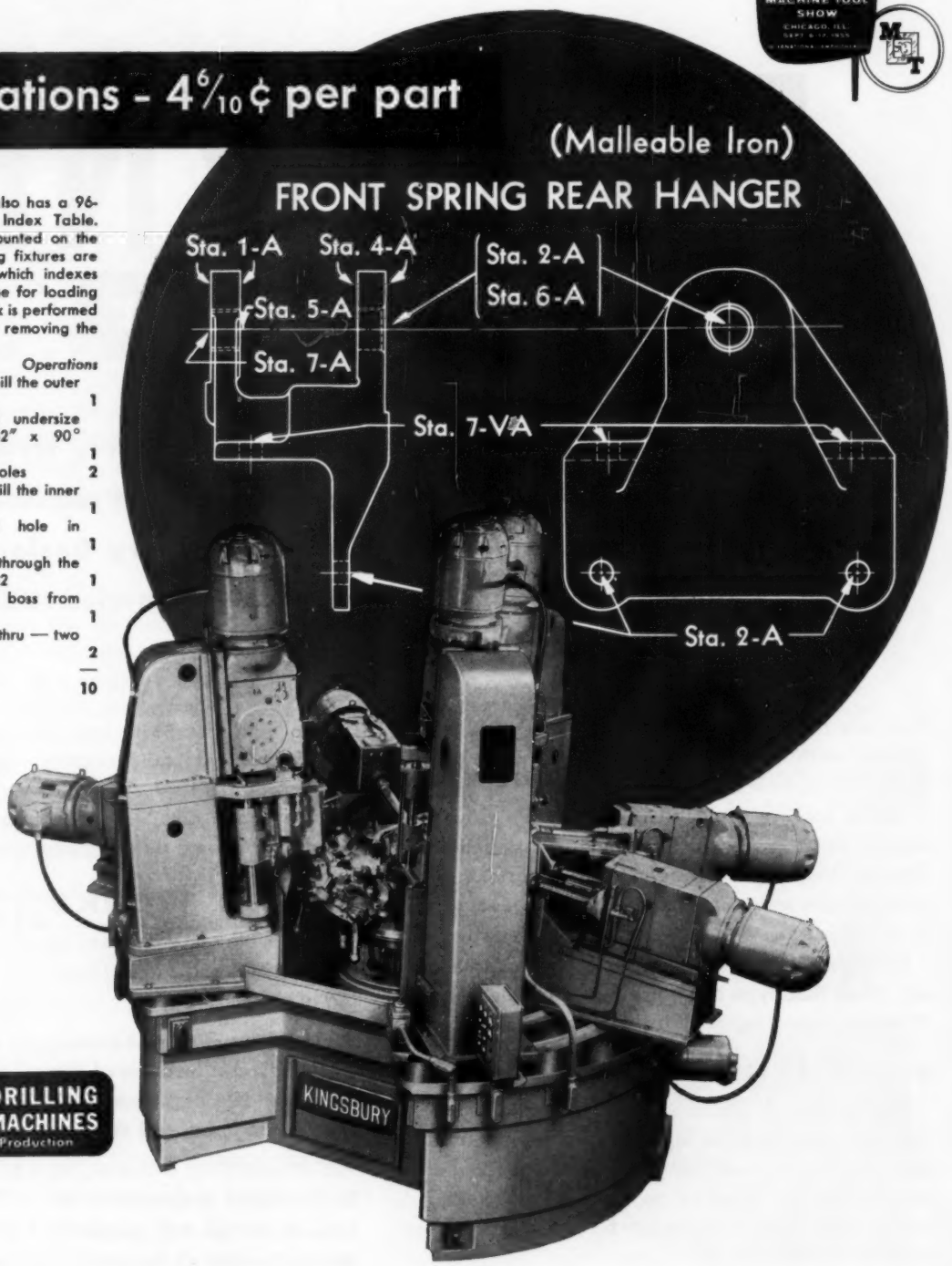
Kingsbury Machine Tool Corporation
111 Laurel Street
Keene, New Hampshire

THE MACHINE TOOL SHOW
CHICAGO, ILL.

10 Operations - 4 6/10 ¢ per part

(Malleable Iron)

FRONT SPRING REAR HANGER



The Kingsbury machine also has a 96-inch base, with 30-inch Index Table. Seven work units are mounted on the base. Eight work-holding fixtures are mounted on the table, which indexes through eight stations (one for loading and unloading). All work is performed at seven stations, without removing the part from the fixture.

Work	Operations
Station 1-A: Straddle-mill the outer boss	1
Station 2-A: Drill .656 undersize and countersink 23/32" x 90° one hole in outer boss	1
Drill .375 thru — two holes	2
Station 4-A: Straddle-mill the inner boss	1
Station 5-A: Drill .562 hole in inner boss	1
Station 6-A: Line ream through the two holes, .656 and .562	1
Station 7-A: Tap inner boss from rear: ⅜ — 16 Tap	1
Station 7-VA: Drill .375 thru — two holes	2
Total Operations	10

AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

FLEXIDYNE

THE DRY FLUID DRIVE

DODGE of Mishawaka Announces An Entirely New Development in Industrial Power Drives that Promises to Revolutionize Drive Performance! Every Design Engineer and Plant Operating Man in America Will Want the Following Information.

Here are the facts on how easily Flexidyne handles difficult starting problems, and gives a *new* kind of protection against shock and overloads.

While new in the United States, this drive has already been proved in thousands of installations in Europe. Dodge has redesigned it to American standards and now makes its dramatic advantages available to all industry.

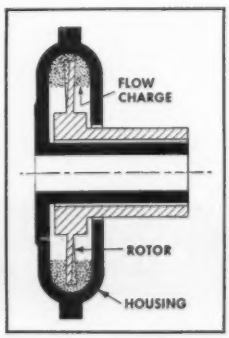
Flexidyne is a *dry fluid drive*. Its advantages over any other fluid-type drive are based on the fact that at normal operating conditions it *does not slip*.

WHAT IT IS

The Flexidyne Drive is made up of a housing, inside of which a rotor is free to turn concentrically. Between the two are fine particles of spherical steel shot, called the "flow charge," which acts very much like a fluid. The flow charge transmits power from housing to rotor.

This flow charge is easy to seal in, has a high density and can stand relatively high temperatures. The use of this flow charge makes possible a design that is simple, compact, economical, and gives outstanding new and different operating characteristics.

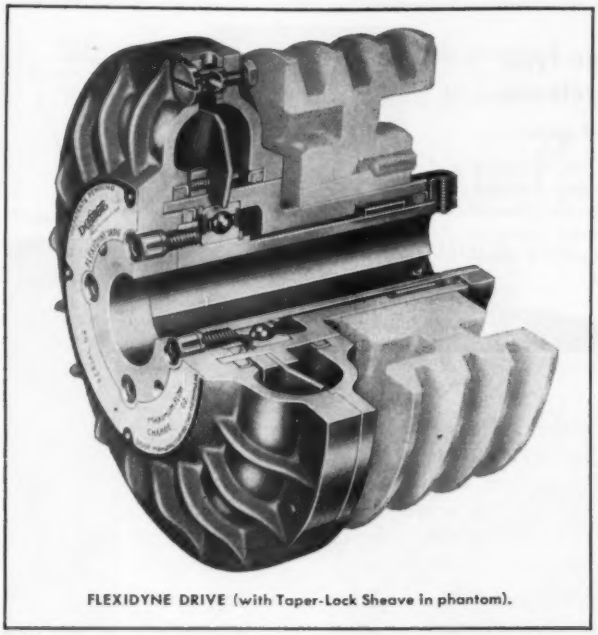
HOW IT WORKS



1. The motor is connected to the housing, and starts it turning at no load.

2. The flow charge is thrown to the circumference of the housing, is compressed by centrifugal force, and revolves with the housing.

3. The rotor, connected to the load, is started and accelerated by the friction and wedging action of the revolving flow charge.



FLEXIDYNE DRIVE (with Taper-Lock Sheave in phantom).

4. Rotor and housing reach identical speeds—the Flexidyne operates with ZERO SLIPPAGE between motor and load at normal running speeds.

5. Before overloads cause damage, the Flexidyne rotor slips relative to the housing, overcoming the friction and wedging action of the flow charge. A thermal switch (optional) automatically cuts the electrical circuit if an overload persists.

6. The amount of the flow charge determines the torque capacity.

WHAT IT DOES

The Flexidyne gives you the *exact* starting torque you need, for anything from the smoothest to the fastest start. Once the load reaches normal speed, there is zero slip, giving 100% efficiency. Also, it provides *accurate* overload protection, as it can be set to slip at any desired load. During starting and overload periods the current draw is at a minimum because with the standard Flexidyne setting the motor is never pulled down to less than 90% of synchronous speed.

All this is due to Flexidyne's completely new principle, which produces *constant torque* for a given input speed, regardless of the percentage of slip between the rotor and housing (which occurs only during starting or overload).

The Flexidyne is simple to select *off the shelf.* Each size has a standard horsepower rating and yet it is only a matter of minutes to vary the flow charge to give you your own *tailor-made torque* to suit the job.

With Flexidyne you get *uniform* performance regardless of changes in the surrounding temperature.

The Flexidyne has very long life and practically negligible maintenance. *Its simplicity guarantees its dependability.* Gas and diesel engines also benefit from all Flexidyne advantages.

Aside from Flexidyne's low first cost, low maintenance, and top efficiency, it permits the use of smaller, cheaper motors and controls with greatly reduced current demands and improved power factor. Its *smoother* starts and *gentler* overload protection avoid breakage and reduce maintenance on drives, gears, bearings and driven machinery.

FLEXIDYNE COUPLINGS

Two lines will be available—*Flexidyne Drives,* for convenient mounting directly on motor shafts and adapted for Dodge Taper-Lock Sheaves, and *Flexidyne Couplings* with Taper-Lock Bushings, for straight line drives. Several thousands of these units of French design, in capacities ranging from fractional to thousands of horsepower, are now in use in Europe. Dodge will first offer — from stock — four sizes rated at 3 to 30 hp at 1800 rpm. Other sizes will follow.

Write now for special bulletin, delivery dates and application information.

DODGE MANUFACTURING CORPORATION
100 UNION STREET, MISHAWAKA, INDIANA

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

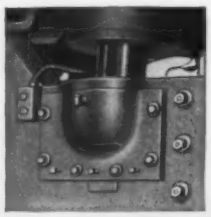
DODGE
of Mishawaka, Ind.

Columbia
press brake features

exclusive wedge type ram pressure release

Ram pressure released quickly!

Simple, yet rugged, this exclusive Columbia feature quickly releases ram pressure when the brake is stalled due to an overload condition. After dies are released, the wedges are easily drawn back into position.



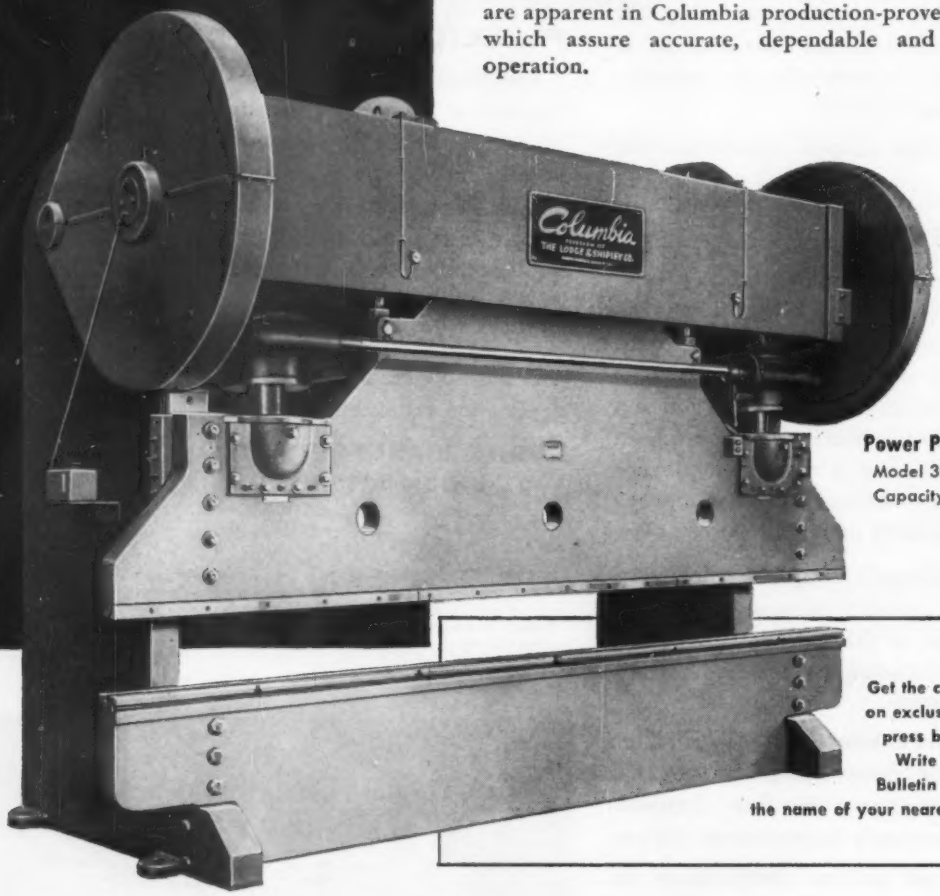
"STUCK" DIES RELEASED QUICKLY and EASILY

...in MINUTES not HOURS!

It's easy to say that a press brake should not be overloaded . . . but occasionally it happens, putting the brake out of operation. If it happens on a Columbia Press Brake, the solution is unusually quick and easy. Pressure is released, and the brake is back in operation in minutes, rather than hours.

The exclusive Columbia Wedge Type Ram Pressure Release is but one of many features on these fine brakes. Among others praised by users for time, money and maintenance savings are: specially designed air clutch and brake and motor-operated micrometer ram adjustment.

Years of experience in the heavy metalworking field are apparent in Columbia production-proved features which assure accurate, dependable and low-cost operation.



Columbia Power Press Brake
Model 350—10
Capacity, 10' x ½"

Get the complete story on exclusive Columbia press brake features. Write for new FREE Bulletin No. PB-3 and the name of your nearest distributor.

COLUMBIA DIVISION THE Lodge & Shipley CO. HAMILTON 2, OHIO

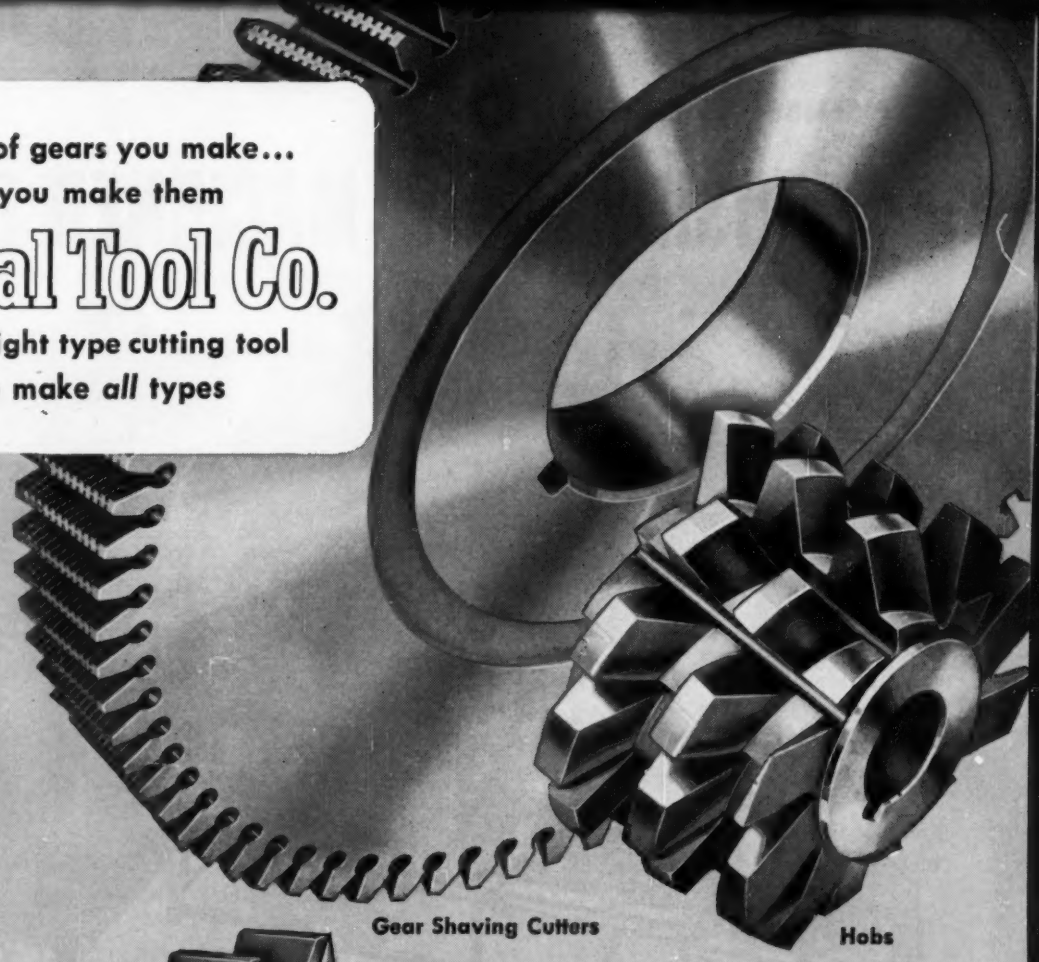
TRANSMISSION EXTENSION

Whatever kind of gears you make...
Whatever way you make them

National Tool Co.

can supply the right type cutting tool
because we make *all* types

National Tool Co., with 50 years experience in the manufacture of special cutting tools, makes *all* varieties of gear cutting tools for *all* types of spur, helical and worm gears—as well as for sprockets and splines. Whatever your gear requirements—large or small—National engineers can help you decide the most efficient method of producing them. Many gear manufacturers have found it profitable to look to National Tool Co. for all their gear cutting tool requirements.



Gear Shaving Cutters

Hobs

Rack Type Gear Shaper Cutters

Involute Gear Cutters

Gear Shaper Cutters

Master Gears

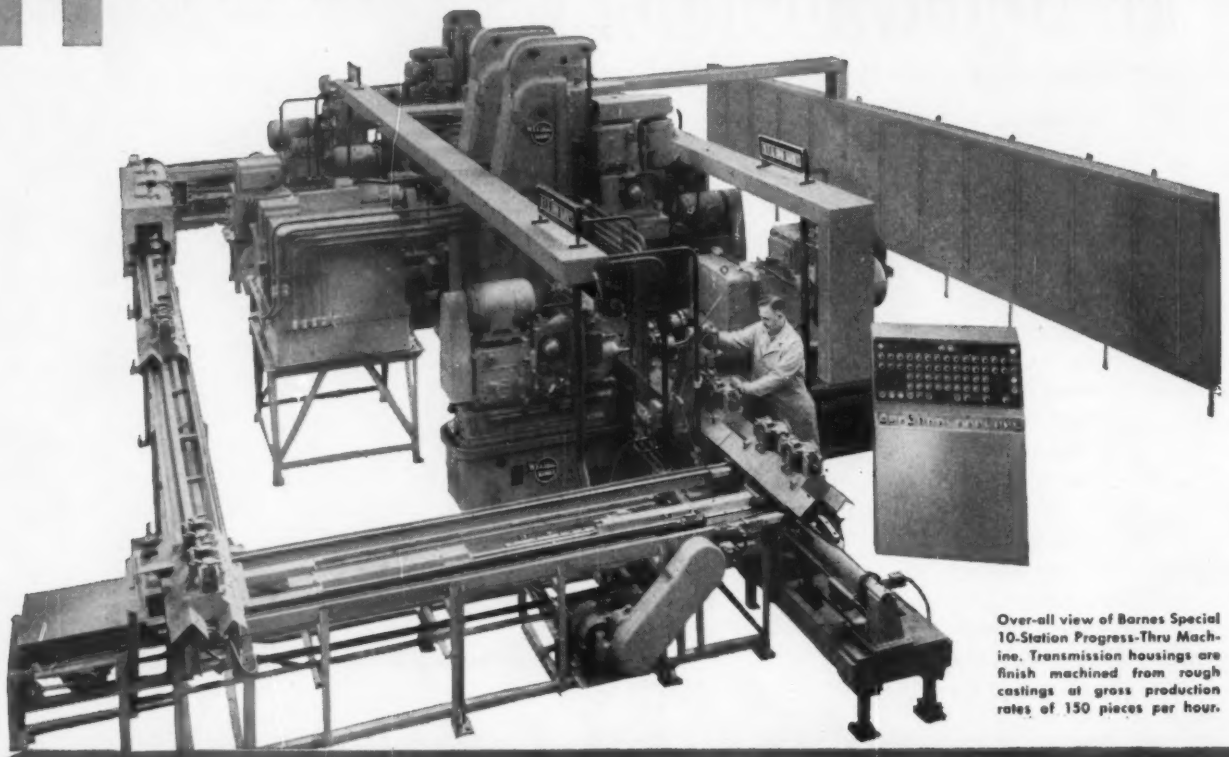
Herringbone Gear Cutters

Representatives in major industrial centers

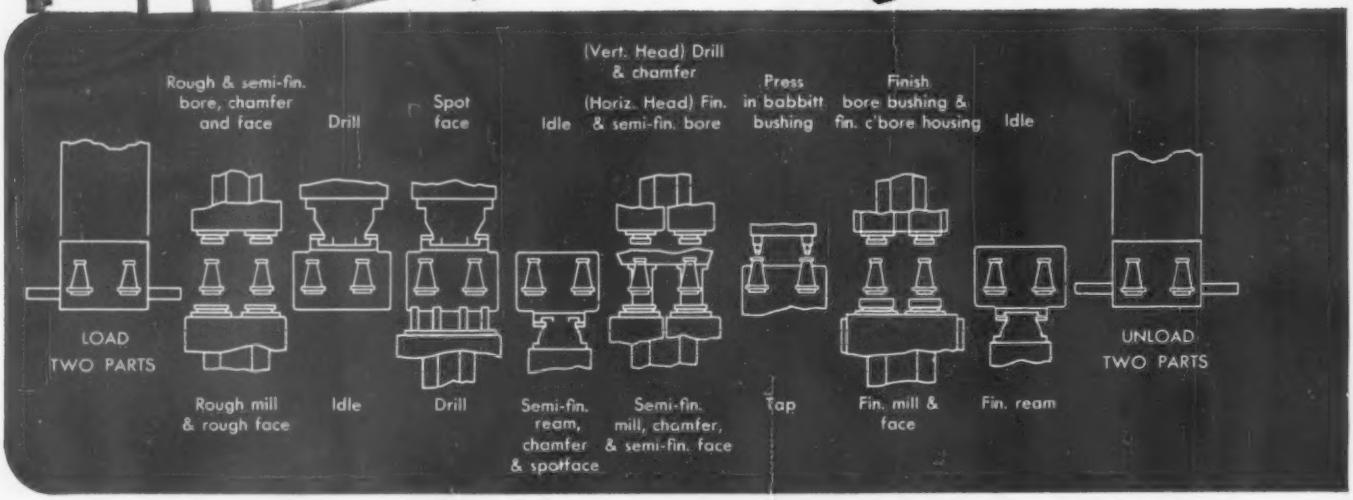
National
TOOL CO.
Cleveland 2, Ohio

TRANSMISSION EXTENSION

HOUSINGS NOW MACHINED COMPLETE



Over-all view of Barnes Special 10-Station Progress-Thru Machine. Transmission housings are finish machined from rough castings at gross production rates of 150 pieces per hour.



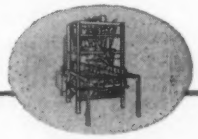
▲ Schematic drawing of machining operations. Total concentricity on all operations does not exceed .002". Housings are held in transfer plates which are located by two hydraulically actuated dowels and clamped hydraulically at each machining station.

Builders of Better Machines Since 1872

W. F. & JOHN BARNES

Special Machine Tools

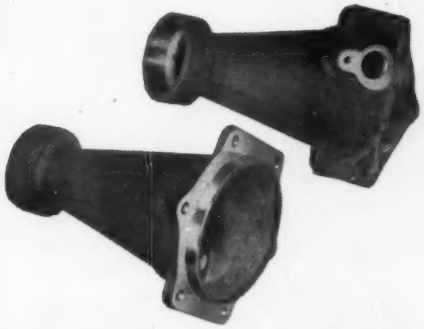
Special Conveyor Units



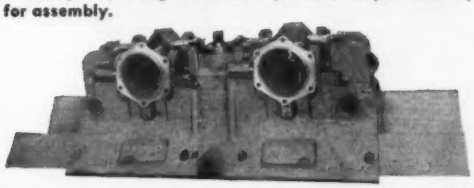
Special Process Equipment

MULTIPLE SPINDLE DRILLING • BORING • TAPPING MACHINES

FROM ROUGH CASTING TO FINISHED PART



Transmission extension housings are finish machined in automatic cycle from rough casting to finished workpiece. After rapid washing and final inspection, the part is ready for assembly.



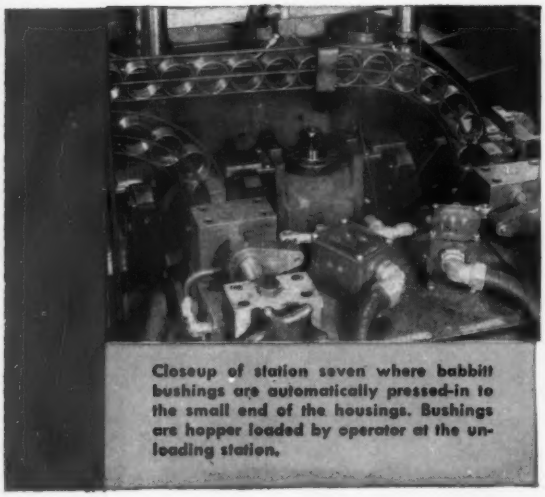
View of workpieces in special transfer plate fixture. Both housings are located and accurately positioned by means of dowels and screw-operated V-block clamps.

ON

W. F. & JOHN BARNES SPECIAL 10-STATION PROGRESS-THRU MACHINE

Here is another typical example of how W. F. & John Barnes Six-Point Machine Tool Building Service has helped increase production efficiency for a leading automobile manufacturer. All machining operations on transmission extension housings are now combined in one Special Barnes 10-Station Progress-Thru Machine at a production rate of 150 pieces per hour. Two operators, one at the loading end and the second at the unloading end, load and unload housings on transfer plates which carry workpieces through the entire machining cycle. Operations include boring, facing, milling, drilling, reaming, automatic press-in of babbitt bushings, and combination finish bore babbitt bushing and finish counterbore housing.

Whether your production requires large or small machines, you'll find the coordinated services at Barnes can help you solve problems quickly and efficiently.



Closeup of station seven where babbitt bushings are automatically pressed-in to the small end of the housings. Bushings are hopper loaded by operator at the unloading station.

BARNES' COORDINATED 6-POINT MACHINE TOOL BUILDING SERVICE INCLUDES:

1. **SPECIALIZED MANUFACTURING FACILITIES**—75-year background, large well equipped plant efficiently tooled to build high production machines.
2. **SPECIAL HYDRAULIC EQUIPMENT**—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
3. **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control, with circuits that assure the most dependable coordination of all machine functions.
4. **SPECIAL GAUGES, FIXTURES, TOOLS**—designed for each individual machining problem, assure accuracy of operations at high production speeds.
5. **SPECIAL HANDLING AND CONVEYOR EQUIPMENT** — designed and built to reduce work handling, effect maximum safety and efficiency.
6. **COORDINATED DESIGN AND ENGINEERING**—Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

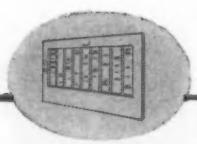
WRITE FOR FREE BOOKLET

Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service.

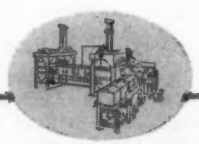
W. F. & JOHN BARNES COMPANY

MACHINE TOOL DIVISION

401 SOUTH WATER STREET, ROCKFORD, ILLINOIS



Special Electrical Controls



Food Machinery

AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

Q. Why does Blanchard grind its own machine parts on a Blanchard?

A. It's the only way we know to get highest quality at lowest cost!

Shown here are 117 different parts of a #18 Blanchard Grinder. 239 surfaces on these 117 parts were ground on a Blanchard, for the simple reason that *there isn't any better way.*

Everyone who uses Blanchard Grinders knows that Blanchard elements are machined with extreme accuracy . . . that they *have to be!*

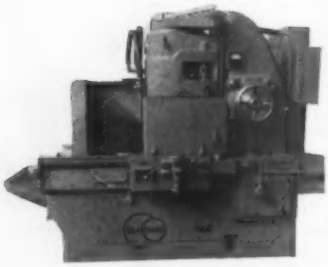
Furthermore, Blanchard users everywhere would undoubtedly agree fully with these two actual statements recently made by customers:

"There is no greater machine tool money value than a Blanchard. It is the best buy we ever made".

"Until our Blanchard went to work, I never realized I could actually save so much, as compared to previous methods of machining flat surfaces".

If you do not own a Blanchard, we invite you to select some of your own components, and let us give you estimates to compare with your present quality control tolerances and machining costs. Chances are you'll find it will pay you to **"PUT IT ON THE BLANCHARD".**

P. S. You guarantee yourself full benefit from your Blanchard Grinders when you use the correct Blanchard abrasive wheels!



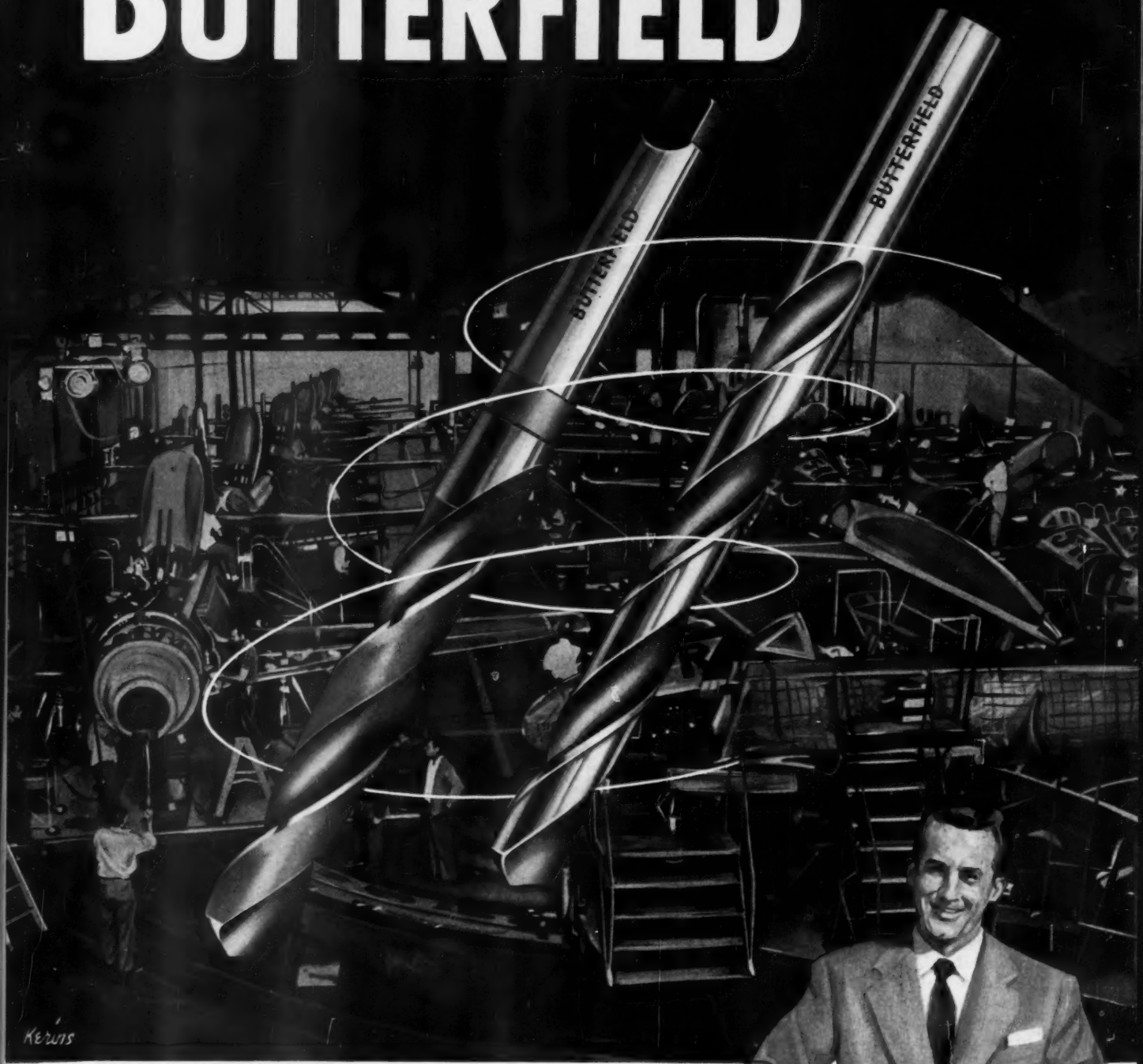
Send for free copies of "Work Done on the Blanchard", (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

BUTTERFIELD

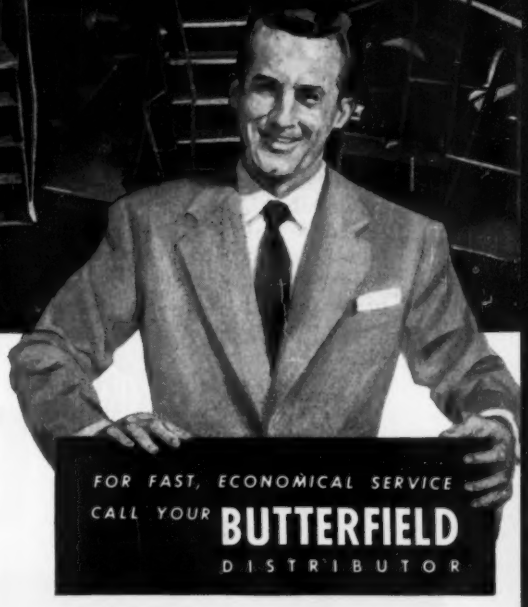


A COMPLETE LINE OF QUALITY cutting tools is now available from your Butterfield distributor. Drills are made to the same exacting standards as Butterfield Milling Cutters, Taps, Dies, Reamers, Counterbores and End Mills.

UNION TWIST DRILL COMPANY

BUTTERFIELD DIVISION

DERBY LINE, VERMONT, U. S. A.



FOR FAST, ECONOMICAL SERVICE
CALL YOUR **BUTTERFIELD**
DISTRIBUTOR

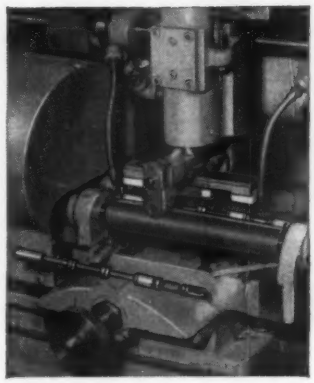
SUPERSONIC... *the Douglas F4D "Skyray"*
breaks the sound barrier at speeds of over 750 m.p.h.

...and GISHOLT SUPERFINISH
breaks another cost barrier!

Do you think of SUPERFINISH as an expensive process? Then it's high time you know the facts.

Here's an excellent case in point... on the record-breaking Douglas "Skyray." Among the most precise parts on this supersonic jet are the slide valves. They're ground from the solid, first on a cylindrical grinder, then on a centerless grinder. Then they're transferred to a Gisholt Superfinisher where the bearing surfaces get a finish of 3 micro-inches, r.m.s. Former time for hand-lapping ran from 2½ to 3 hours per piece. The Gisholt SUPERFINISHER does it in 45 seconds! Think of it: less than 1/200th of the time! And think what that does to costs!

If SUPERFINISH can improve your product, as probably it can, better get the facts. The complete story is in the booklet "Wear and Surface Finish." Ask us for your copy.



Approximate diam. of slide valves (lower left) is ½" with reduced diam. of ¼" between collars, or bearing surfaces. Parts are handled on the Gisholt Superfinisher in only 45 seconds per piece.

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

The "see-through" safety guard was specially made for this photo only.

Distinctive RED blotter on a new WHITE wheel is the sign of COOL tool grinding worth cheering about! And that's not all...V40 Bond Tool Room Wheels by CARBORUNDUM cut faster, last longer and permit heavier infeeds without burning the stock or overheating the tool, even on die steels and hi-vanadium types. And the outstanding form-holding ability of V40 Bond Wheels eliminates costly stops for wheel dressing halfway through a job. Try one in your shop today. There's a type for every tool room operation...easily identified by the V40 on the bright red blotter. Your CARBORUNDUM Distributor or salesman will arrange a free demonstration. For Bulletin A-1310, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through product quality and application "know-how"

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

All belt and two yards wide

(Guard lifted and coolant flow stopped to reveal belt action.)

PHOTOGRAPHED AT BELL AIRCRAFT CORPORATION.

86 inches wide, in fact—by 138 inches long...*all* belt! Here's why: to generate taper of the required precision on huge aluminum aircraft "skins," conventional milling methods were far too slow and costly. So CARBORUNDUM abrasive engineers, in collaboration with the Air Force, Bell Aircraft Corporation, and the Hill-Acme machine people, designed and produced this special belt, in proper gradings to meet the rigid specifications of surface finish and dimensional accuracy.

● If *you* are stymied by an unusual grinding problem, turn to the source with the greatest experience and application "know-how" in the abrasive field today! Call in your CARBORUNDUM Distributor or salesman, or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

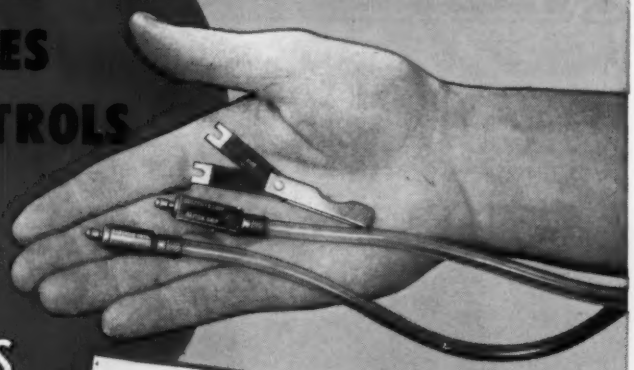
Through application "know-how" and product quality

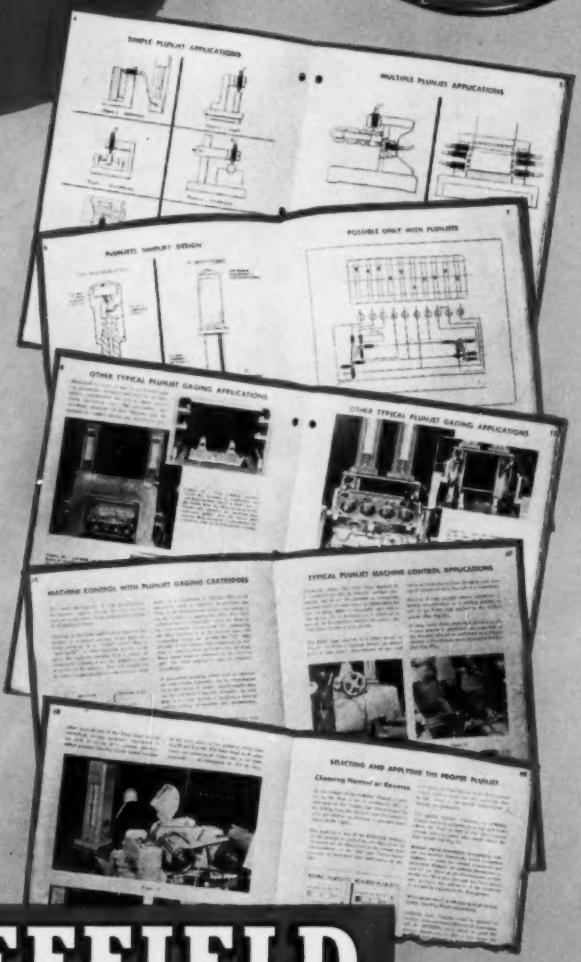
CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

MAKE YOUR OWN GAGING FIXTURES and MACHINE CONTROLS *with* "PLUNJET" GAGING CARTRIDGES





LOW COST— HIGH ACCURACY

- Check any dimension or geometrical relationship
- Control feed of machine tools precisely
- Tolerance range .100"—.0001"
- Amplification range 62.5—5000
- Applicable with any air gage
- Bodies ⅜" square or cylindrical
- Two lengths, 1½" and 1¾"
- Only one moving part
- Immediate delivery in quantity
- Low cost

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DAYTON 1, OHIO, U. S. A.

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SIGNED_____ POSITION_____

COMPANY_____ STREET_____

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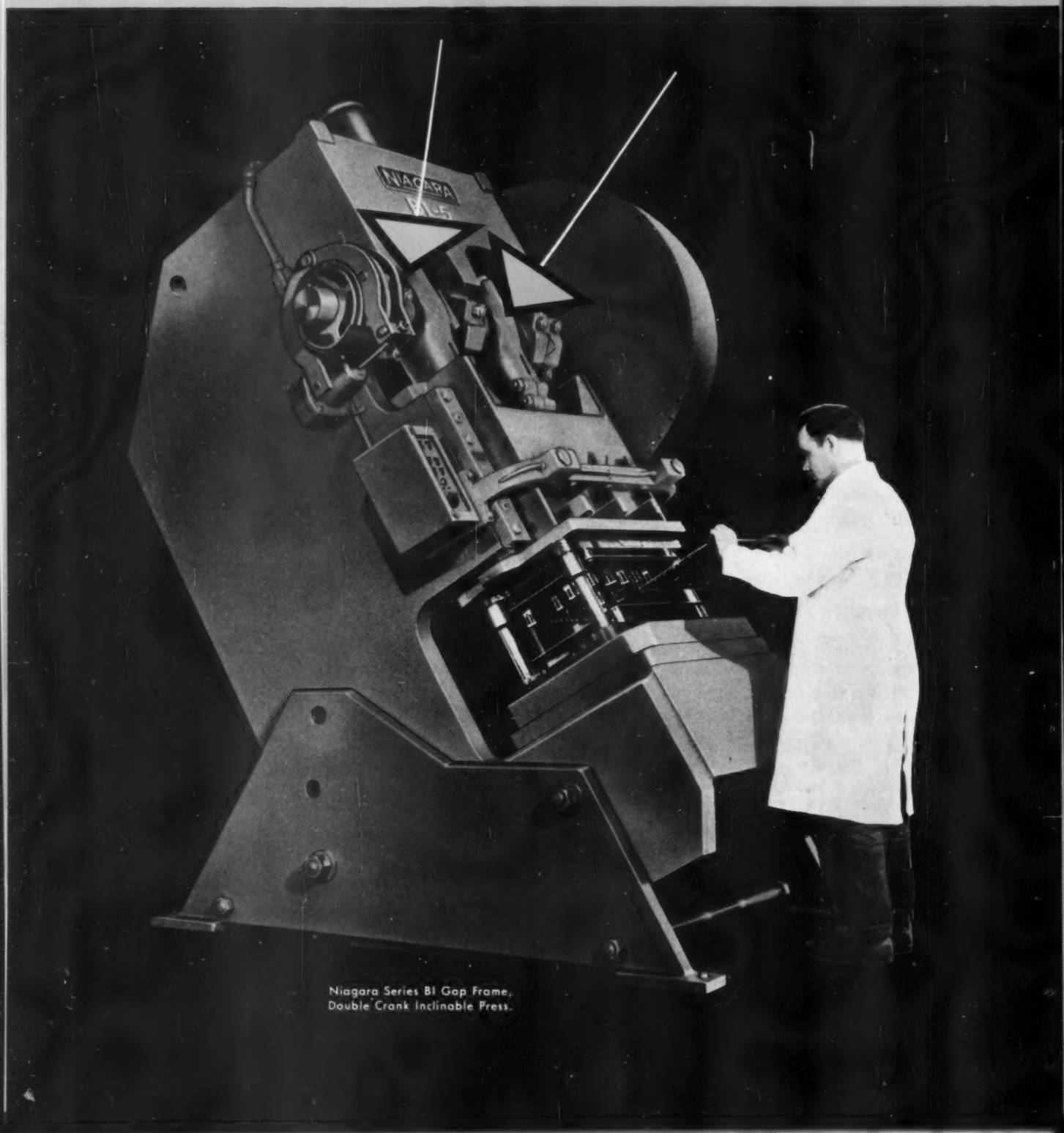
continually puts more **sense** in your abrasive **dollar**

NIAGARA 2 POINT tomorrow's



Niagara Series BI Gap Frame, Double Crank Inclinable Press.

INCLINABLES

design for today's production needs*

From crown to base . . . *taking in every part and operating feature* . . . the Niagara Double Crank Inclinable Press Series stands alone in advanced engineering. By record and by reputation, this is the press with the best future for cost-cutting, production-boosting, *long die area work.*

*** LONGER LIFE FOR LONG DIES**

Niagara's double crank design resists tilting of the slide under off-center loading, thereby reducing misalignment of dies. Rugged, welded steel plate, box type slide rigidly supports punches. Heavy duty, rigid, integrally built frame properly resists deflection, maintaining permanent alignment of bearings and slide.

FASTER WORK HANDLING

Die area is accessible from *all* sides. Work may be fed from either side or front-to-back with equal facility, and is quickly discharged by gravity through the unobstructed opening in the back when the press is inclined . . . *yes, even long work!*

GREATER VERSATILITY

A tremendous variety of blanking, perforating, forming and drawing operations can be performed, with emphasis on work requiring long die areas. All presses in the series are designed to readily accommodate pneumatic die cushions which Niagara furnishes complete with accessories and fittings.

HIGHER PRODUCTION RATE

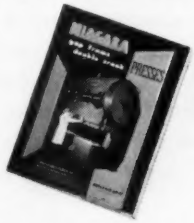
Optionally equipped with automatic feeds and variable speed drives, Niagara 2-Point Inclinables are well suited to large quantity production and long, continuous runs.

MORE ECONOMICAL MAINTENANCE

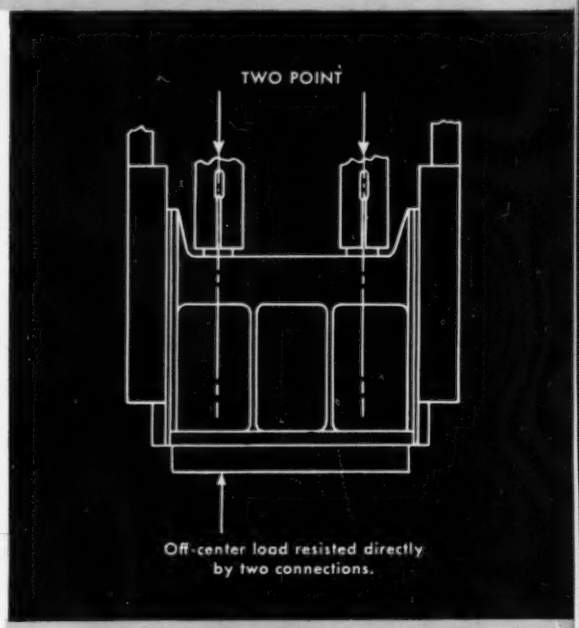
Features that spell *stamina* and *ruggedness* . . . welded steel plate frames with box section crowns and deep beds forming rigid ties between uprights; welded steel plate, box type slides; precision "V"-flat gibs; bronze bushed main bearings; self-aligning ball-seat connections; Niagara electro-pneumatic and mechanical sleeve clutches . . . all combine to keep maintenance at a practical minimum.

• • •

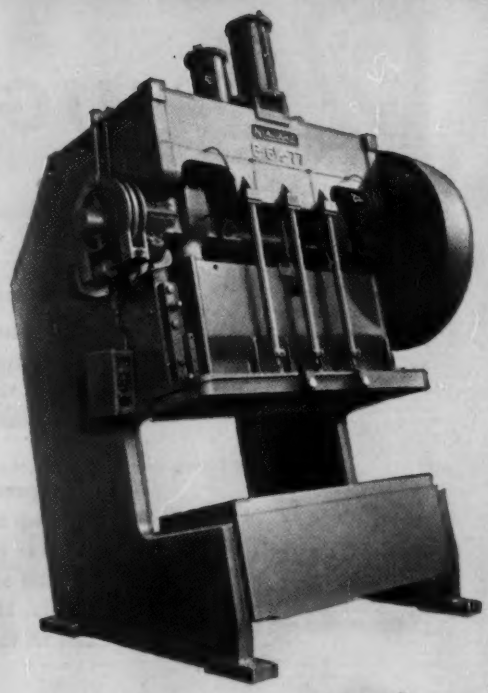
Standardized in capacities from 65 thru 222 tons, Niagara Series BI Double Crank Inclinable Presses are your most logical answer to long die area work. For still longer requirements, Niagara builds a complete line of permanently inclined or upright Series B Presses.



Obtain complete details on *all* the noteworthy Niagara features by requesting Bulletin 65. Consult with a Niagara engineer about *your* problems.



Off-center load resisted directly by two connections.



Niagara permanently inclined, gap frame, double crank press.

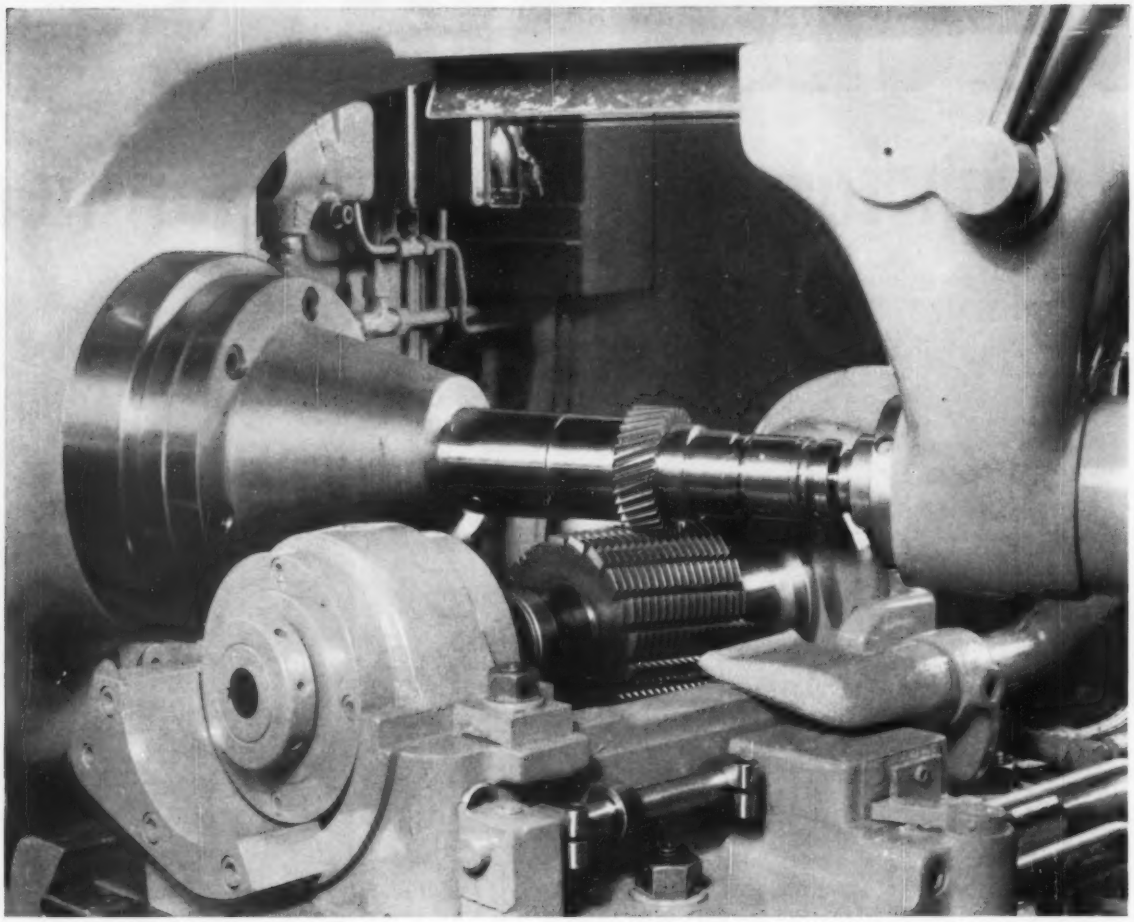
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

THE MACHINE TOOL SHOW



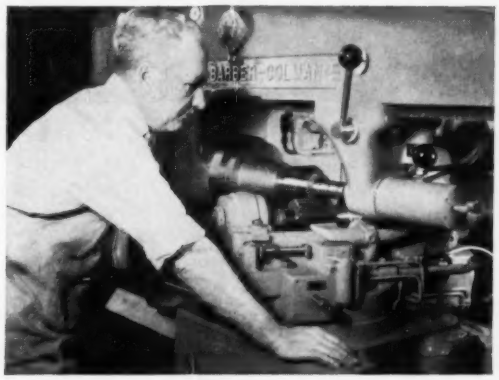
HIGH-SPEED HOBBING

INCREASES PRODUCTION AND TOOL LIFE

The Barber-Colman No. 14-15 Hydraulic Hobbing Machine is being used in several plants for hobbing of steel gears at speeds of approximately 300 SFM with an increase in both production and tool life. Although these speeds have not been considered practical until recently, the size, power and rigidity of the No. 14-15 Machine make it ideal for high-speed hobbing. Even with a standard hob slide, speeds of 300 SFM with a 5" hob are possible. However, most machines for high-speed hobbing are equipped with a special tapered roller bearing hob slide.

The high-speed hob slide is capable of speeds up to 700 RPM and is designed to accommodate hobs up to 6" diameter. This slide provides the rigidity to maintain accuracy at high speeds. It is equipped with precision tapered roller bearings. An automatic hob shifter may be furnished as extra equipment. Feeds up to 6" per minute are available for use with high speed slides. High-speed hob slides and gears for higher feed rates may be installed on recent machines in the field. For speeds over 700 RPM another hob swivel assembly is available.

BUILDERS OF PRECISION GEAR



The jobs shown here indicate at least 200% increase in production, 100% better tool life, greater profile accuracy and equal or improved surface finish on the hobbed gears, hobbing at speeds of 300 SFM or greater. Using ground and unground hobs, gears were cut from a wide range of steels as high as 207 Br. hardness.

FIRST SERIES OF TESTS

GEAR		STANDARD HOB SWIVEL		HIGH-SPEED HOB SWIVEL		% INCREASE	
DP	No. Teeth	Cutting Time at 135 SFM	Pieces Per Shift	Cutting Time at 326 SFM	Pieces Per Shift	Prod.	Tool Life
6	36 Spur	10.64 min.	72	4.2 min.	161	153%	123%
6	35 Spur	11.62 min.	72	4.5 min.	151	158%	109%
8	55 Helical	15.14 min.	50	6.94 min.	105	118%	110%
8	62 Helical	26.8 min.	28	10.3 min.	72	160%	157%

Double Thread Hob, 5x5x2
Steel — AISI 8620 normalized
Feed — .060"/rev.
No difference in surface quality
Profile and lead angle above average accuracy

SECOND SERIES OF TESTS

HOB	GEAR	SPEED	FEED
Accurate Unground 9 D.P. 3-Thd. 5x5x2	22 Teeth, Helical SAE 5135 170-207 BHN	307 SFM	.045"/rev.
Same	Same	307 SFM	.070"/rev.

Climb Hobbing
Material — AISI 5135
Average lead error—at .070" feed within .0006" in 13/16"
Total Composite Error—.002" both feeds
Estimated Hob Life—200 per sharpening
Using same speed and feeds with conventional hobbing, resulting finish was not as good.

Although high-speed hobbing of steel gears is not used extensively as yet, it is used on enough jobs to prove that it is applicable under the proper conditions. Tests indicate that tool life increases until a speed of 200 SFM is reached, and then drops off rapidly to a speed of 250 SFM. After 250 SFM, however, hob life increases again until it is equivalent or better at 300 SFM than at 200 SFM. Materials on which satisfactory results have been produced include AISI 1113, 8620, 5135 and 4140.

Our Engineers have been working with our customers on high-speed hobbing and have helped to solve many problems. They will be glad to discuss the economy of high-speed hobbing to your specific job if you will submit your part print and production requirements to them.

Call your Barber-Colman representative or write direct to:

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

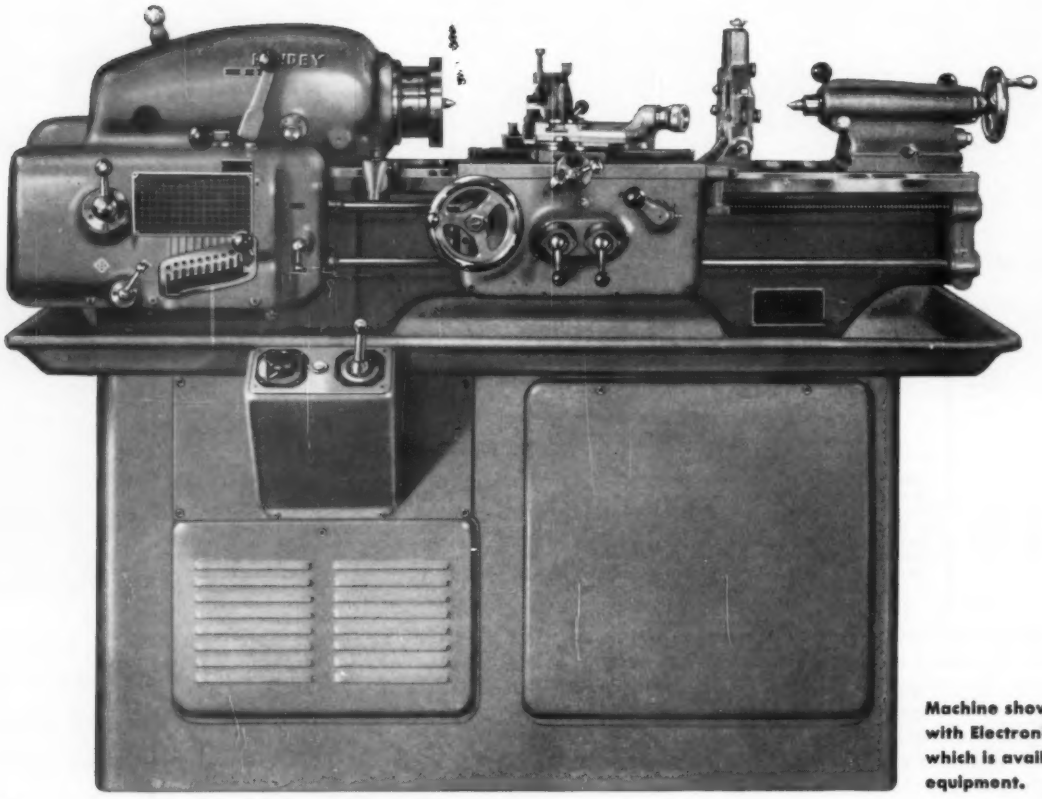
BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 615 ROCK STREET, ROCKFORD, ILLINOIS

HOBS AND MACHINES SINCE 1911

Hendey TOOL and GAGE MAKERS LATHE for PRECISION HIGH



Machine shown is equipped with Electronic Speed Control which is available as extra equipment.

TOPS IN ACCURACY . . . HENDEY PRECISION-BUILT

SPEED PRODUCTION

HEAVY DESIGN,
HIGHLY ADAPTABLE AND SENSITIVE
FOR PRECISION WORK AT HIGH SPEEDS.

The Hendey 9" x 24" Tool and Gage-Makers Lathe provides maximum precision and versatility for tool-room and production use. Some of the features of the standard machine include:

Infinitely variable spindle speeds to 3000 RPM
Convenient operation
Hardened and ground V ways
66 quick-change thread cutting and feed changes
Pre-loaded, super-precision, anti-friction spindle bearings
Precision lead screw
Feed shaft independent of lead screw
10¼" swing over ways — 24" Center distance

As extra equipment, this lathe can be furnished with an electronic speed selector for maximum sensitivity of spindle speeds and for full torque at low speeds. Speeds are infinitely variable and can be changed smoothly and easily while under load.

Whatever your toolroom and production problems may be, investigate the 9" x 24" Tool and Gage-Makers Lathe. Call your nearest Hendey representative, or write for bulletin.

See It In Action! Booth No. 221.

MACHINE TOOLS *Hendey* **machine division**
BARBER-COLMAN COMPANY
515 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN

While time ran out he used to wait
For shipments that would come too late . . .

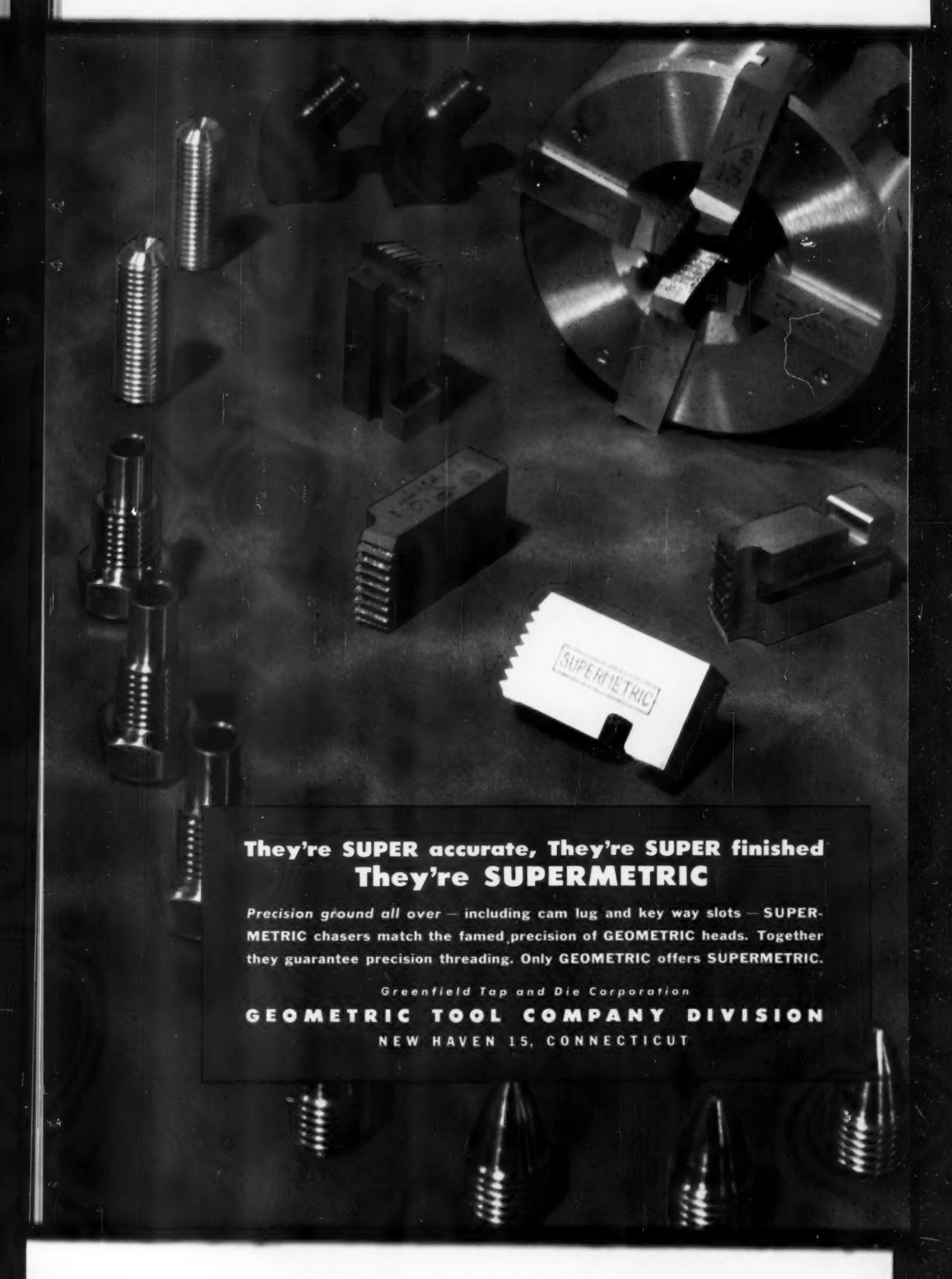
But now, for speed, he's sure to stress
He wants things sent ***RAILWAY EXPRESS!***

The big difference is

Railway Express makes the big difference in speed, economy, and safe, sure delivery. Whether you're sending or receiving, whether your shipment is big or small, and whether it's moving by rail or air, it will pay you to specify shipment by Railway Express. It's the complete shipping service in the American tradition of private enterprise.

RAILWAY EXPRESS AGENCY

. . . safe, swift, sure



They're SUPER accurate, They're SUPER finished
They're SUPERMETRIC

Precision ground all over — including cam lug and key way slots — SUPERMETRIC chasers match the famed precision of GEOMETRIC heads. Together they guarantee precision threading. Only GEOMETRIC offers SUPERMETRIC.

Greenfield Tap and Die Corporation

GEOMETRIC TOOL COMPANY DIVISION

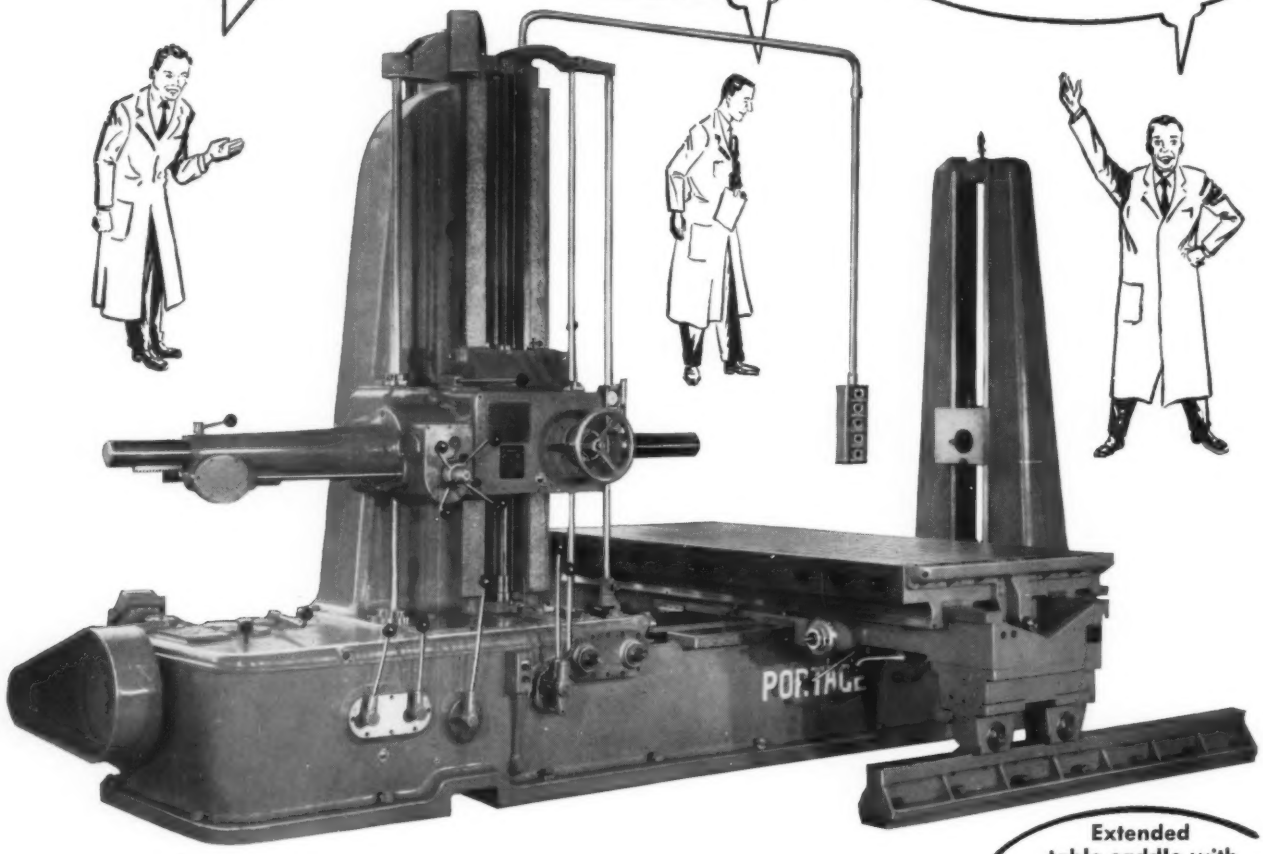
NEW HAVEN 15, CONNECTICUT

CHECK THESE *Features...*

4" spindle diameter, precision machined nitralloy steel.

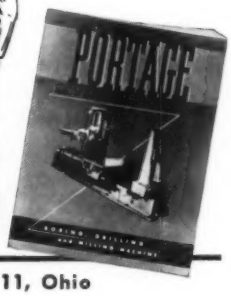
Pendent controls include spindle rotation, forward, reverse, jog forward, jog reverse and stop.

36 spindle speeds 8-1000 R.P.M. 18 Feeds.



Extended table saddle with adjustable supports and runways makes it possible to handle the big jobs, too!

Unusually wide and deep base, cast entirely in one piece . . . offers excellent rigidity.



PORTAGE MACHINE PRICES START AT $31,358 COMPLETE. The PORTAGE Horizontal Boring, Drilling and Milling Machine is a precision built tool. Only the finest of materials and workmanship go into its manufacture . . . and at a comparatively lower cost. Get ALL the facts . . . write for literature and specifications . . . *TODAY.*

PORTAGE
METAL WORKING SPECIALISTS

THE PORTAGE MACHINE CO.

1026 Sweitzer Avenue • Akron 11, Ohio

Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

No. 1 in a series

AHEAD

STEPS

You get demonstration of your work and complete job development record

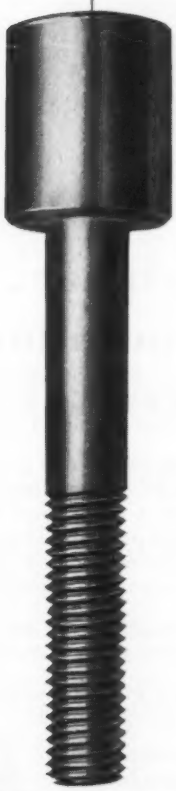
FOUR

Cone submits samples of your work

BE

Cone makes recommendations

You send print to Cone

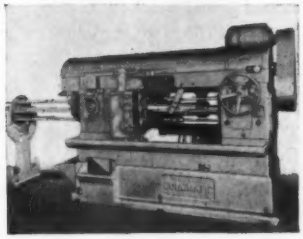


Cone's four-step carbide development service obligates no one to purchase a Conomatic. It simply demonstrates what it takes of machine, personnel, and tools for profitable use of 100% carbide tooling on multiple spindle bar automatics.

Clients of this service have praised it highly. Some have used it for immediate production advantage. A lesser number have used it in preparation for anticipated competition later. All are completely convinced that an "automatic" proved superior for carbide is a superior "automatic" for hss.

DATA FOR COMPARISON

Part.....Support Post	Length.....5¾" Cutoff 4¼" Turn 2" Thread
Machine.....1⅝" Conomatic	
Tools....100% Carbide Tipped	RPM.....1562 Work Spdl. 1022 Thr'd Spdl. 2584 Total Eff.
Material.....X-1112	
Stock Size.....1¼"	Time.....15 Secs.

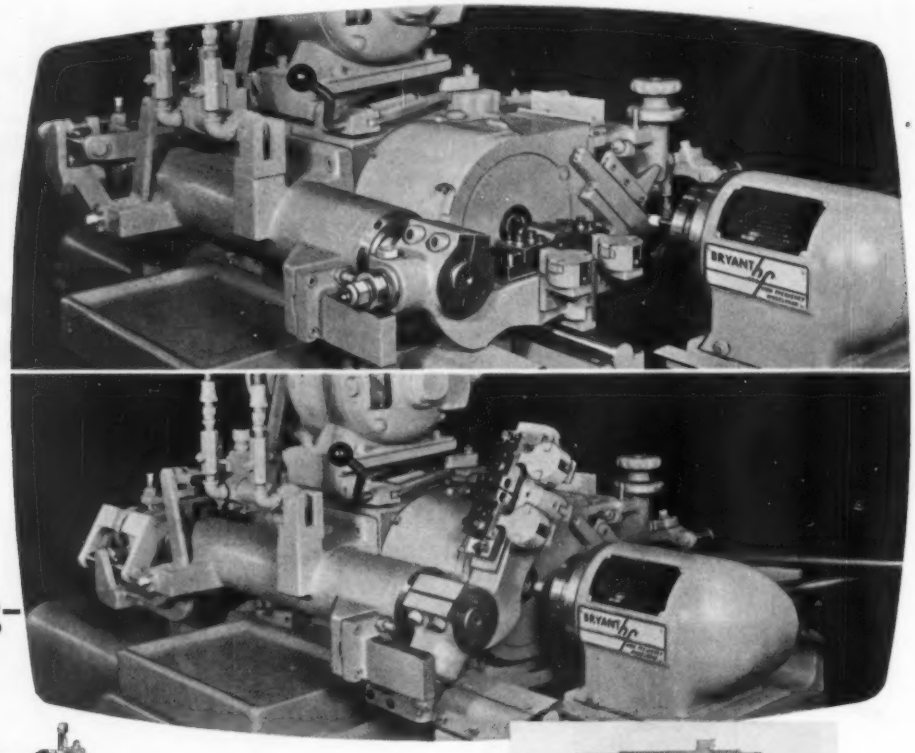


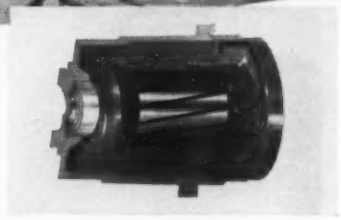
Conomatic

Write, wire, or phone today for particulars on "Four Steps With Cone".

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

To cut costs and save rehandling-





BRYANT internal grinder . . . combines boring and grinding operations

These photos show how a Bryant Internal Grinder eliminates rechucking of workpieces, resulting in increased production and reduced scrap at Bendix Aviation Corporation's Eclipse-Pioneer Division.

Here, a Bryant model 1209-Y speeds up a fast moving production line by performing both boring and grinding operations on synchro motor housings. Single point carbide tools bore two holes and a face simultaneously in each housing. The grinding operation consists of grinding the stator bore. A fine ground finish is necessary to eliminate possible burrs in the stator slots which could cause failures. Bryant precision alignment assures concentricity held well within the required .0003" tolerance for size, roundness and concentricity. This method has resulted in cutting scrap more than 50% over previous methods used.

Fully automatic Bryant grinders featuring automatic loading and sizing can be readily integrated into your automated production lines. Models ideally suited for tool room and small lot work are also available.

Bryant grinders offer you operating economy — at peak production rates. Their adjustable precision alignment ensures maximum accuracy and minimum maintenance — factors that cut cost per piece.

Write for our free Alignment booklet. Ask, too, for a reservation card for our new sound color movie "Alignment for Better Internal Grinding" — free showings arranged for engineering groups.

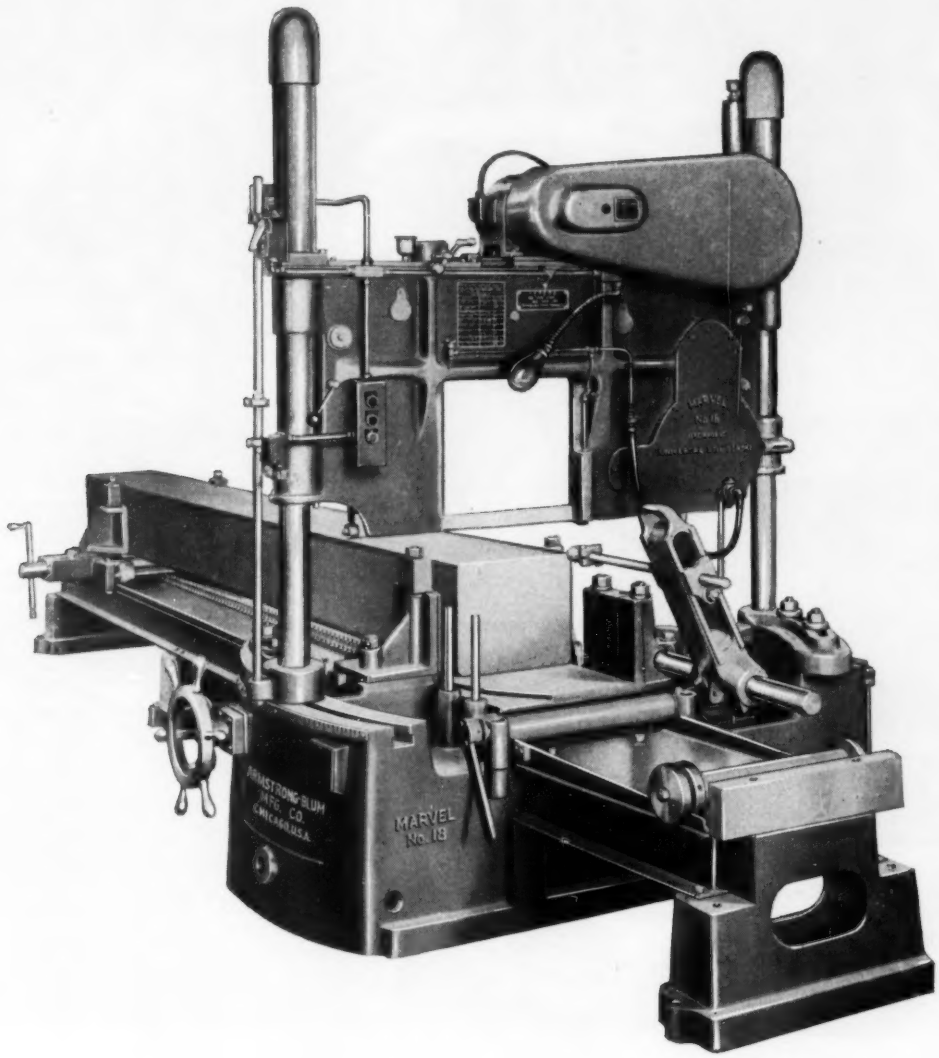
BRYANT

chucking grinder co.

SPRINGFIELD, VERMONT, U.S.A.

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates



No Job too big or too tough . . .

for MARVEL "*Giant*" Hack Saws

These giant MARVEL Hydraulic Hack Saws (No. 18, Capacity 18″ x 18″; and No. 24, Capacity 24″ x 24″) were *basically* designed for rapid and economical cut-off of BIG WORK. They are not merely "conventional" designs "stretched" to big capacity. They are truly designed and built with the ruggedness and rigidity necessary to withstand the rough treatment of sawing big work, even though the work is in the "toughest of the tough" alloys.

They are reliably fulfilling the cut-off requirements in innumerable steel mills, forge shops, structural shops, warehouses, and machine shops, with assured low tool cost and minimum kerf loss of steel.

In addition to cutting-off, they are reducing costs by eliminating further machining operations. Heat treated die blocks are being reclaimed for re-sinking by sawing off the worn face; columns, beams, pipe, and tubing are being sawed to *finished*, square ends, eliminating milling; angular sawing is done conveniently by swinging the upper structure on the base, to any angle up to 45 degrees—*without moving the work*.

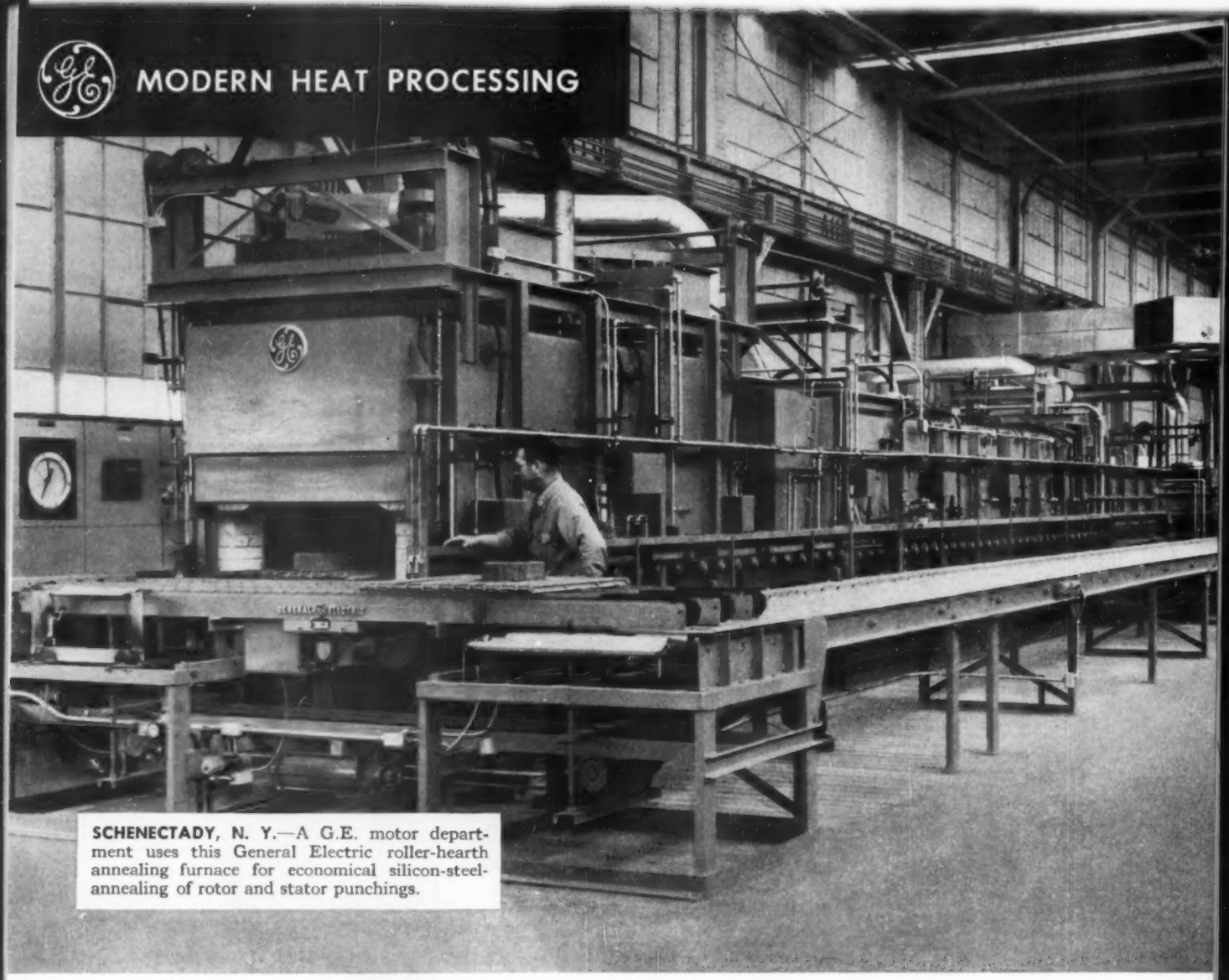
Contemplating the modern trend toward ever tougher steels and larger sizes, these are the logical sawing machines to buy, not only for today's needs but for tomorrow's as well.

Write for Catalog

MARVEL *Metal Cutting* SAWS
Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

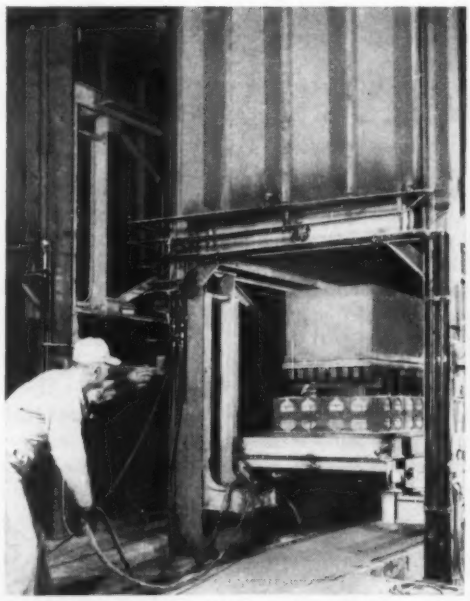
MODERN HEAT PROCESSING



SCHENECTADY, N. Y.—A G.E. motor department uses this General Electric roller-hearth annealing furnace for economical silicon-steel-annealing of rotor and stator punchings.

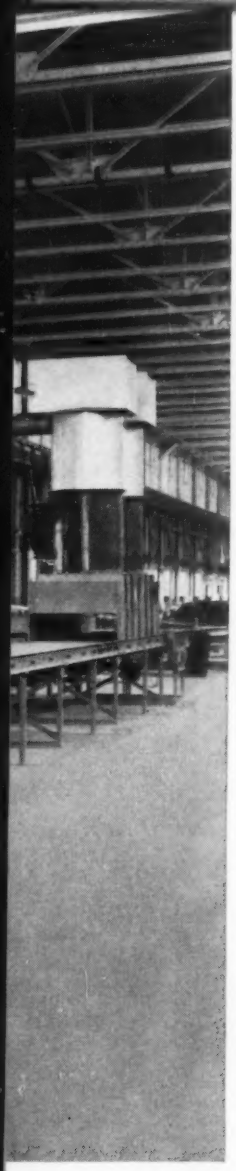
WIDE VARIETY OF G-E ANNEALING FURNACES NOW LETS YOU ANNEAL SILICON STEEL RIGHT IN YOUR OWN PLANT

Take a tip from General Electric, user of about 25% of the country's production of silicon steel—you can cut costs by annealing your own silicon steel. There's a General Electric silicon steel annealing furnace for nearly every type of annealing application—large or small. For example, the furnaces at right are located in different G.E. plants, each handling a different size silicon-steel-annealing job—*economically*.



G-E ELEVATOR FURNACE at Rome, Ga. plant is used for high temperature annealing of transformer cores—furnace fits in minimum space.

G-E BELL FURNACE, Waynesboro, Va. Low-production unit anneals machine parts at low cost.



PROBLEM:

Annealing silicon steel in an automated setup

SOLUTION:

G-E roller hearth furnace anneals stator punchings and weld in one pass, cuts costs

A roller hearth furnace in the new automated production line for one of G.E.'s motor departments anneals 1500 pounds of rotor and stator punchings an hour—helps produce a Tri-Clad* 55 motor (7½ to 35 hp) every 2½ minutes. The stator punchings and weld are annealed at the same time. This eliminates the cost and time involved in making two passes through the furnace. Only one man is needed to oversee the complete annealing operation.

IN ADDITION TO G-E furnace quality, here are the advantages you receive when you deal with G.E. on silicon steel annealing:

(1) TECHNICAL KNOWLEDGE—G-E research helped pioneer the development of silicon steel for improved magnetic properties.

(2) EXPERIENCED USER—G.E. uses about 25% of the total production of silicon steel.

(3) EXPERIENCED BUILDER—G.E. offers a complete line of furnace and control equipment for your silicon steel annealing.

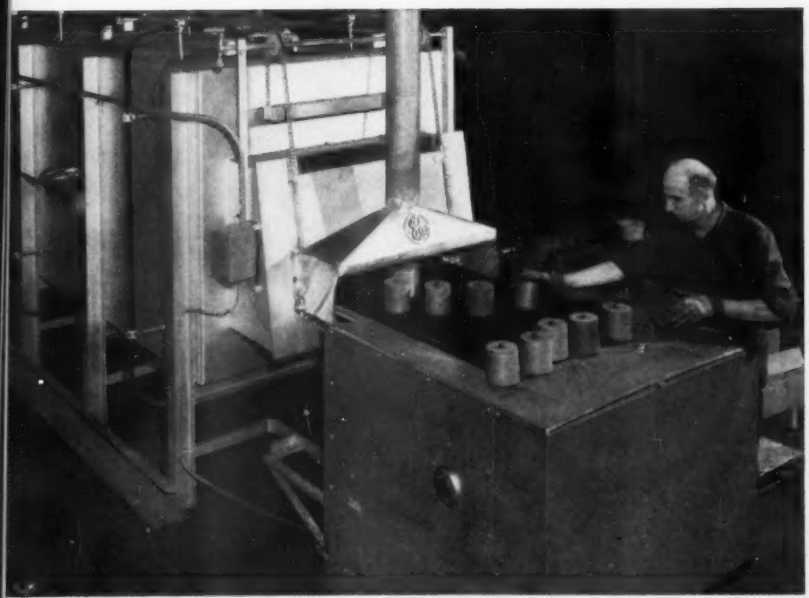
(4) APPLICATION HELP—plus installation supervision—assure you of the most efficient furnace installation.

(5) MAINTENANCE SERVICE—Nearly 200 G-E service shops, located throughout the country, are ready to help you 24 hours a day.

ASK FOR THE SERVICES of your local G-E Apparatus Sales Representative in assessing the economies of annealing silicon steel in your plant. Just call your nearby General Electric Apparatus Sales Office.

*Reg. trademark of General Electric Company.

GENERAL ELECTRIC



G-E MESH-BELT FURNACE located at Ft. Wayne, Ind. plant blue-anneals rotor laminations. Ideal for medium production, the mesh-belt furnace is flexible for use over a wide range of temperatures and speed.

FREE PROCESS BULLETINS

Please send me the Modern Heat Processing bulletins I have checked below.

- ☐ Protective Atmospheres, GEA-5907
- ☐ Annealing Malleable Iron, GEA-5797
- ☐ Furnace and Induction Brazing, GEA-5889
- ☐ Wire Enameling, GEA-6179
- ☐ Heat-treating Aluminum, GEA-5912
- ☐ Forging with Induction Heat, GEA-5983

General Electric Company
Apparatus Sales Division, Section C721-4
Schenectady 5, New York

Name.....

Position.....

Company.....

City..... State.....

STANDARD
technical service clicks at Argus Camera

Personnel at Argus Camera Company were having trouble with the grinding of thread plug gauges. Grinding oils used failed to hold the required accuracy. They called in L. H. Walker, Standard Oil industrial lubrication specialist. He recommended Standard's SUPERLA Thread Grinding Oil A, and Argus began using it. That was four years ago. What happened? SUPERLA Thread Grinding Oil has helped Argus grind thread plug gauges with such accuracy, so consistently, rejects are virtually eliminated.

Small job? Yes. Small volume of oil used? Yes. But the results are big business to Argus Camera. That makes it important to Standard Oil. It is another demonstration of what this unbeatable combination can do when put to work:

1 Standard lubrication specialists capable of giving technical help.

2 Top quality products *that deliver results required.*

Put this combination to work in your plant. In the Midwest there is a lubrication specialist in your nearby Standard Oil office ready to help you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY

(Indiana)

Omer L. Parks (left), tool and gauge grinder for Argus Camera, inspects thread plug gauge with L. H. Walker, Standard Oil industrial engineer. Lyman Walker has been working with customers for 25 years helping them solve problems like the one at Argus. A native of Detroit, Lyman Walker is familiar with the lubrication problems of industry in the territory he serves. This together with his wide experience makes him ideally qualified for this work. Customers find his experience pays off for them.

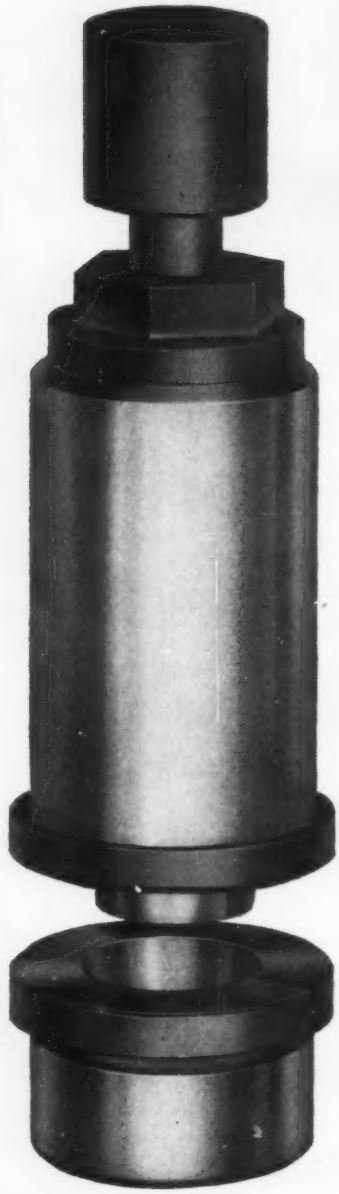
POWER OF PRECISION PRODUCTS

STANDARDIZED

UNIVERSAL INDEX PLUNGERS

SAVE TIME
SAVE MONEY

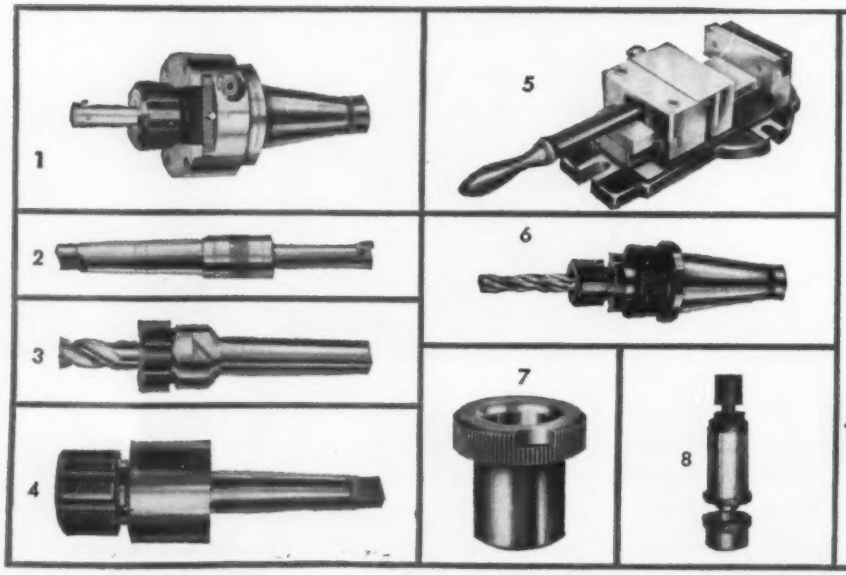
Universal's Straight and Taper Plungers made in standard sizes save the time and expense of designing and machining special index plungers for multi-station tools. They come to you complete, ready for installation at approximately ¼ the cost of specially made plungers.



Soft pin knob permits connection to actuating lever or air cylinders by several different methods. Locating bushing, plunger and plunger bushing are hardened and ground.

Plunger is easily assembled from either top or bottom. And it can be removed in either direction by removal of hex nut.

Universal Plungers greatly simplify jig or fixture manufacture because plunger body and bushing have same diameter so that all holes can be bored with same tool, often in same setting.



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1 MICHIGAN

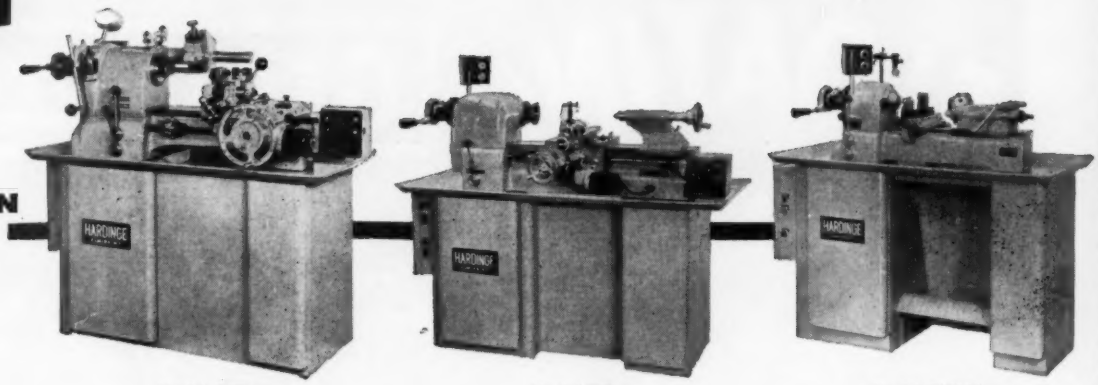
(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

168

HARDINGE
ELMIRA, N.Y.

PRECISION PRODUCTS

PRODUCTION MACHINES

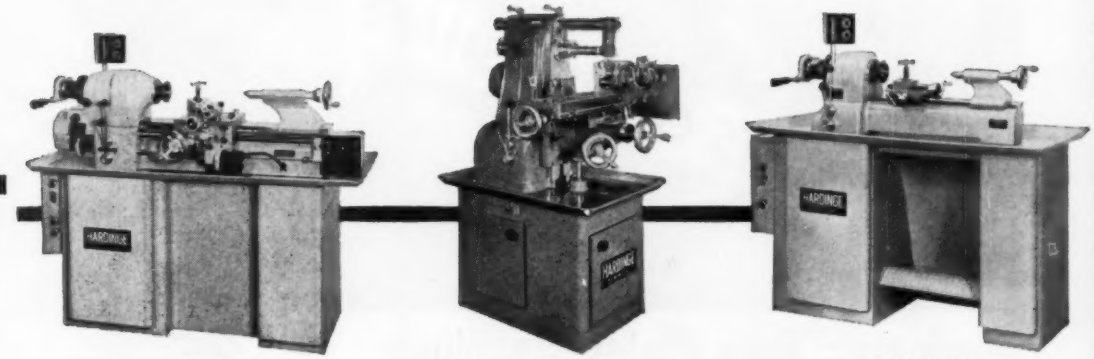


Model HCT
Chucking Machine
with Threading Head

Model TFB
Turning, Facing
and Boring Machine

Model DSM59
Second
Operation Machine

TOOL ROOM MACHINES

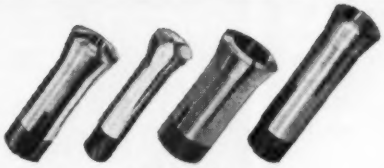


Model HLV
Tool Room Lathe

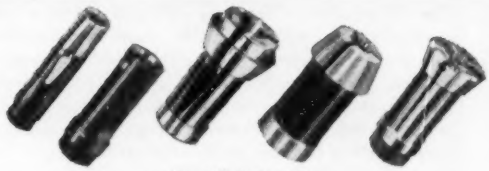
Model UM
Universal Milling Machine

Model DV59
Lathe

HARDINGE
COLLETS—
FEED FINGERS—PADS

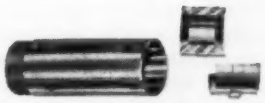


For All Lathes
Millers - Grinders



For All Automatics
Chucking Machines and Turret Lathes

Adjustable Tension
Master Feed Fingers



Style "B"
Master Feed Fingers

Style "S"
Master Collets

HARDINGE-SJOGREN
SPEED COLLET CHUCKS

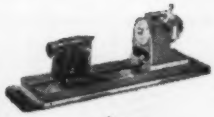
for Cam-Lock
Spindles

for Tapered
Key-Drive Spindles

for Threaded Nose
Spindles

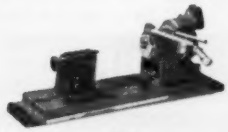
for American
Standard Spindles

HARDINGE
COLLET INDEX FIXTURES



for
Tool Room

for
Inspection Departments



for
Production Departments

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

eliminates: Base Plates, Couplings Line Shaft and External Gearing

The Philadelphia "Floating" GearMotoR is a new concept for powering steel mill roll tables, conveyors, textile machines and many other industrial drives. This motorized worm gear reducer mounts directly on the driven shaft, and requires no mounting provisions other than a simple torque arm . . . the GearMotoR is supported by the same bearings as the drive shaft, thus the power unit is reduced to its simplest form.

Because the Unit actually "floats" with the driven shaft, there is no problem in providing for and maintaining alignment . . . the power unit and the driven shaft become a simple integral unit.

The "Floating" GearMotoR can be mounted in almost any location, and the use of right angle worm gearing permits the GearMotoR to nestle close to the driven machine, thus saving valuable floor and aisle space. Also, special design and sealing features make it possible to mount it in any desired position — motor horizontal, vertical up or down.

The "Floating" GearMotoR is manufactured in both single and double gear reductions offering a wide range of out-put speeds from 9 to 420 rpm. Motors are available in almost any required combination of electrical characteristics ranging in size from 1 to 15 horsepower.

Proof of the outstanding performance and reliability of the "Floating" GearMotoR lies in the many successful installations throughout the United States and Canada.

Send for Catalog F-54, and be convinced.

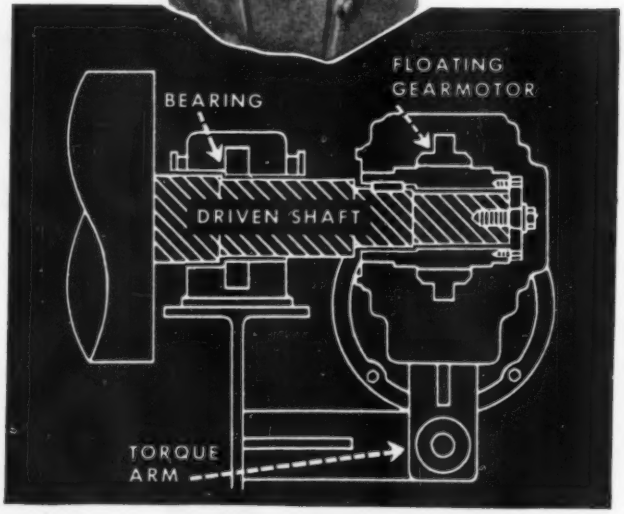


Illustration shows simplicity of assembly and mounting of the "Floating" GearMotoR in the motor-horizontal position. GearMotoR and driven shaft are supported on same set of bearings.
Note compactness of the installation.

PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. & G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
Virginia Gear & Machine Corp. • Lynchburg, Va.

Industrial Gears & Speed Reducers

LimiTorque Valve Controls

Established 1892

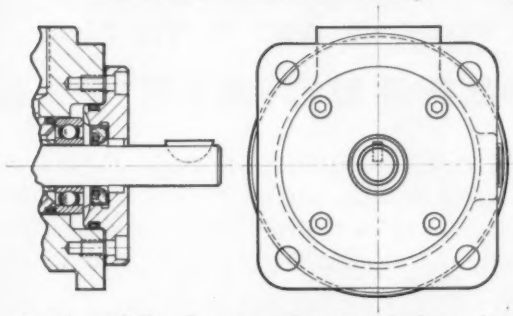
One Waldes Truarc Ring Saves a Pound in Weight Replaces Cast Retainer Plate and Four Screws

Denison Vane Type Pump/Motor

The Denison Engineering Company of Columbus, Ohio uses a Waldes Truarc Beveled Retaining Ring (Series 5002) in their pump/motor to achieve a simpler, lighter, more easily assembled unit and to cut both material costs and production time.

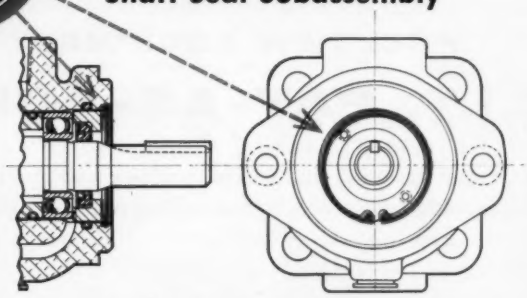
This vane-type power package operates as either a fluid pump or motor without alterations of any kind. Built for 2000 psi continuous duty, rugged construction was essential.

Shaft Seal Subassembly



Experimental Way: One cast retainer plate plus four socket head cap screws hold unit together. Assembly requires skilled labor, machinery, time-consuming careful adjustment.

Shaft Seal Subassembly



Truarc Way: Waldes Truarc beveled retaining ring (internal 5002) retains shaft and bearings, takes up accumulated tolerances rigidly, prevents leakage around shaft. Unit is one pound lighter. Assembly is quick and easy, more economical.

Wherever you now use machined shoulders, bolts, snap rings, or cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Truarc Rings are precision engineered, quick and easy to assemble and disassemble.

More than 5,000 stock-sizes of the different Truarc ring types available. Ninety stocking points throughout U. S. A. and Canada.

Find out what Waldes Truarc Retaining Rings can do for you toward reducing costs and improving your product. Send your blueprints to Waldes Truarc Engineers for individual attention without obligation.

For precision internal grooving and undercutting . . . Waldes Truarc Grooving Tool!

Send for new catalog supplement

WALDES
TRUARC®
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

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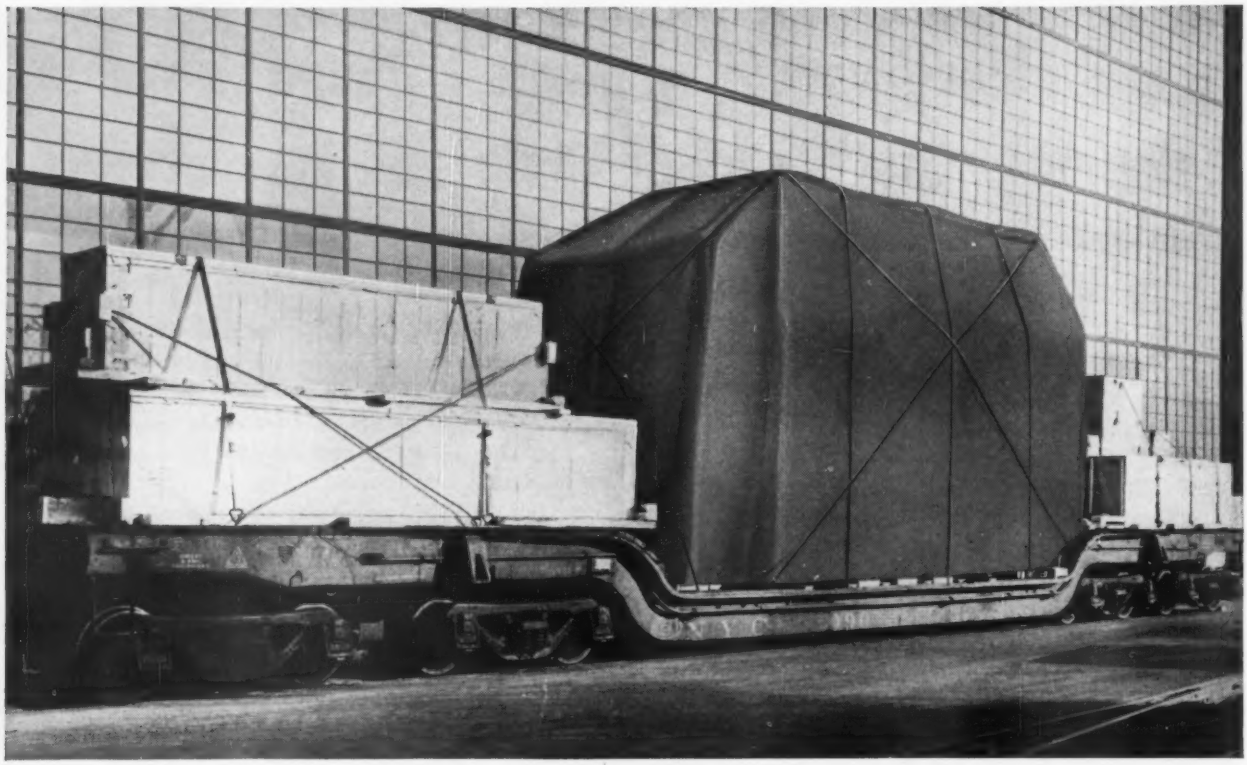
Company.....
Business Address.....
City.....*Zone*.....*State*.....

AM057

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.



ROLL NEW EQUIPMENT INTO YOUR PLANT WITH THE

C.I.T. PAY-AS-YOU-DEPRECIATE PLAN

The chances are good that you have obsolete equipment which should be replaced with new profit-producing units. But your cash may be earmarked for other purposes. There is a way to break through this profit barrier:

Combine any one of the new fast depreciation methods with the C.I.T. PAYD PLAN. This gives you the best way to put modern equipment to work in your plant.

PAYD PLAN lets you finance new equipment with:

1. Minimum use of your liquid cash.
2. Instalment payments geared to fast depreciation write-off advantages.
3. Long terms.

PAY-AS-YOU-DEPRECIATE PLAN is solving equipment purchase problems and making new profits possible in many industries. It covers such categories as machine tools, material handling equipment and construction equipment.

Terms range from six to ten years. The PAYD PLAN charge is 4.25% for each year of the term, computed on the original unpaid balance.

New PAYD PLAN folder describes how you can put new machinery to work right away. Just write; we'll send it without obligation.

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The Wholly-owned Industrial Financing Subsidiary of C.I.T. Financial Corporation
Capital and Surplus over $200,000,000

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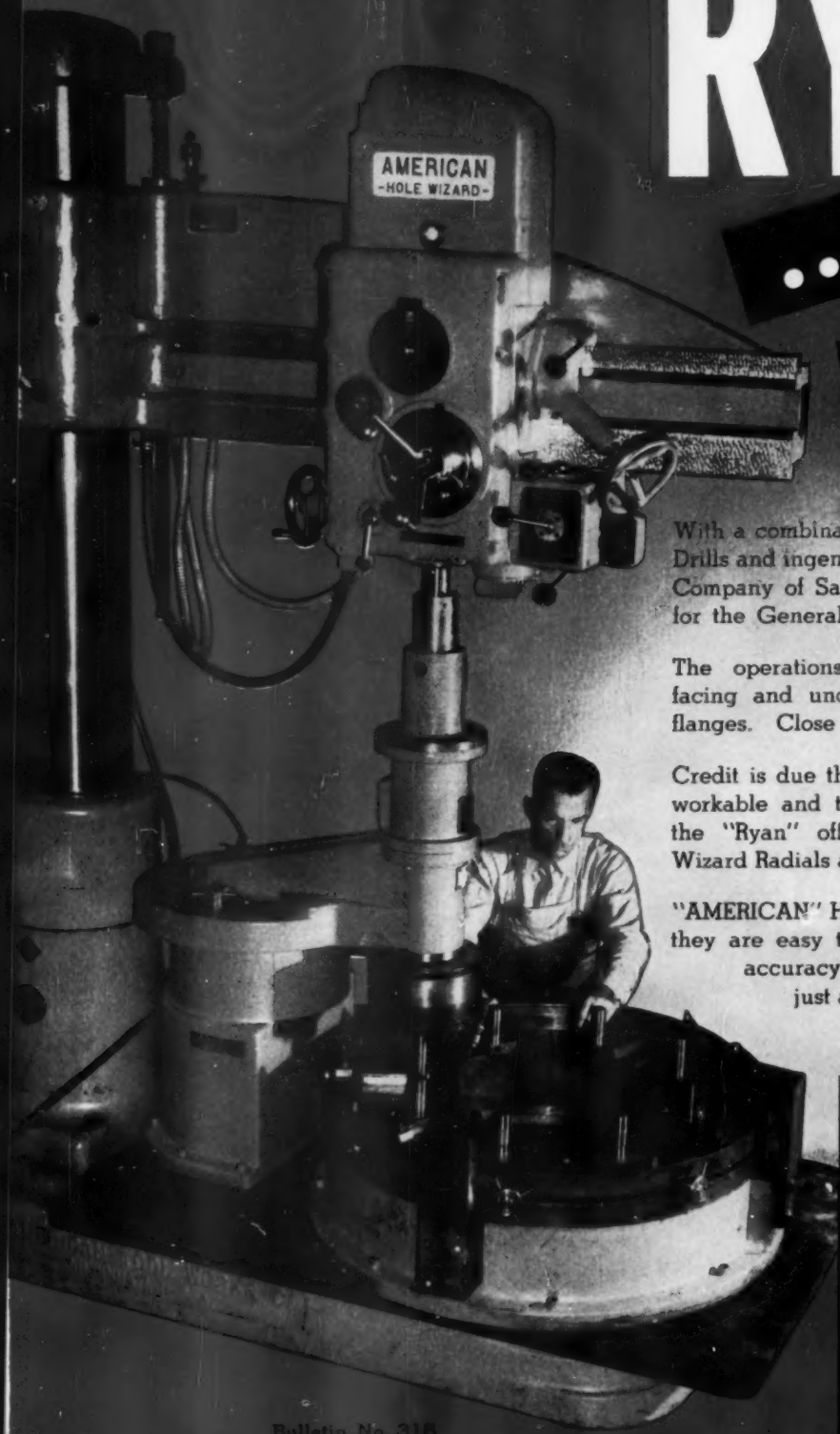
Industrial financing available in Canada through Canadian Acceptance Corporation Limited

RYAN ...HITS THE JACKPOT!

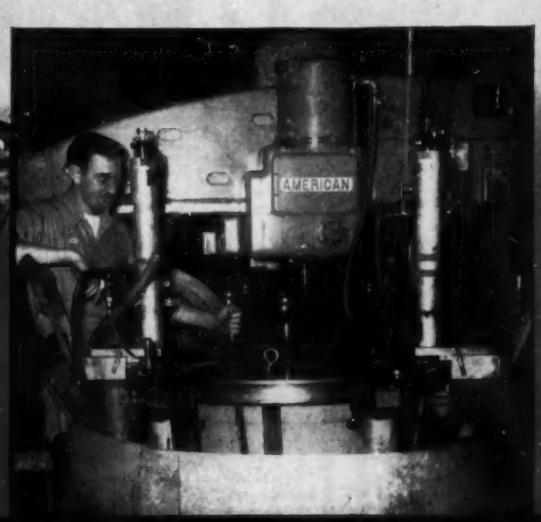


With a combination of "AMERICAN" Hole Wizard Radial Drills and ingeniously designed fixtures Ryan Aeronautical Company of San Diego, California, produces Aft Frames for the General Electric J-47 jet engine in record time.

The operations performed include precision boring, facing and undercutting of the stainless steel support flanges. Close tolerances must be and *are* held.

Credit is due the "Ryan" engineers for developing such workable and time saving fixtures. Credit is also due the "Ryan" officials for selecting "AMERICAN" Hole Wizard Radials as part of the "winning combination."

"AMERICAN" Hole Wizards are sturdy; they are powerful; they are easy to operate and they retain their original accuracy for years to come. For substantiation just ask the operator.

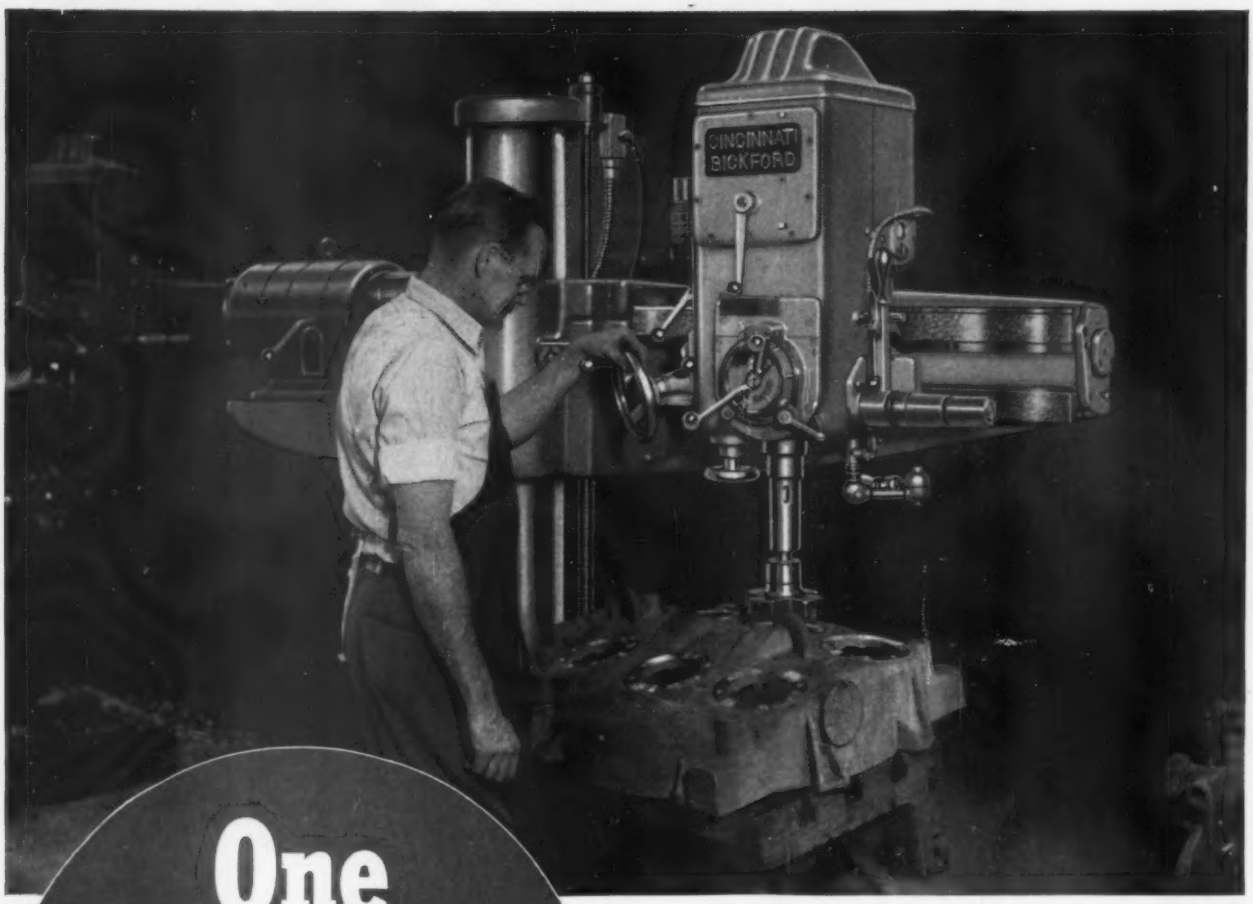


Bulletin No. 315
will give you the facts

THE AMERICAN TOOL WORKS CO.

Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



One set-up saves 30%

Photos courtesy of the Kelman Electric & Mfg. Company, Los Angeles, California.

Boring, facing, and high speed drilling with one set-up cut the floor to floor time about one-third on this job.

The Kelman Electric & Mfg. Company say their Cincinnati Super Service Radial Drill "handles easily, is very accurate and versatile."

They are facing 6" diameters; drilling for ½" bottom tap, and tapping with a ½" bottom tap on this job.

The part being processed is a Bronze Top Casting.

Cincinnati Super Service Radial Drills are profit makers in this shop, and they could be in yours.

Write for Bulletin R-21C

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

DISSTON
HAS THE EDGE®

Ask for Disston Super-Safe Hack Saw Blades

and blades that hold it!

to give you faster, straighter power hack sawing

Here's the sharpest, cleanest cutting machine hack saw blade the industry has ever seen. These blades set a new standard of quality and safety. They are completely new—made by new methods, with the latest equipment. No wonder they easily meet the toughest production requirements.

Let us show you how much you will benefit. Call your Disston Distributor today. He'll put on a practical demonstration *right in your shop*. He'll let you make your own side by side comparison tests on your own machines. Also ask him about Disston's complete line of *Hand* Hack Saw Blades and Frames—for the same economies and results.

For prompt service, expert advice, reliability, many economies, on these and other Disston metal cutting products—Files, Band Saws or Solid and Inserted Tooth Metal Circular Saws, rely on your Disston Distributor. You'll get far more for your tool dollar.

send for this FREE production help!

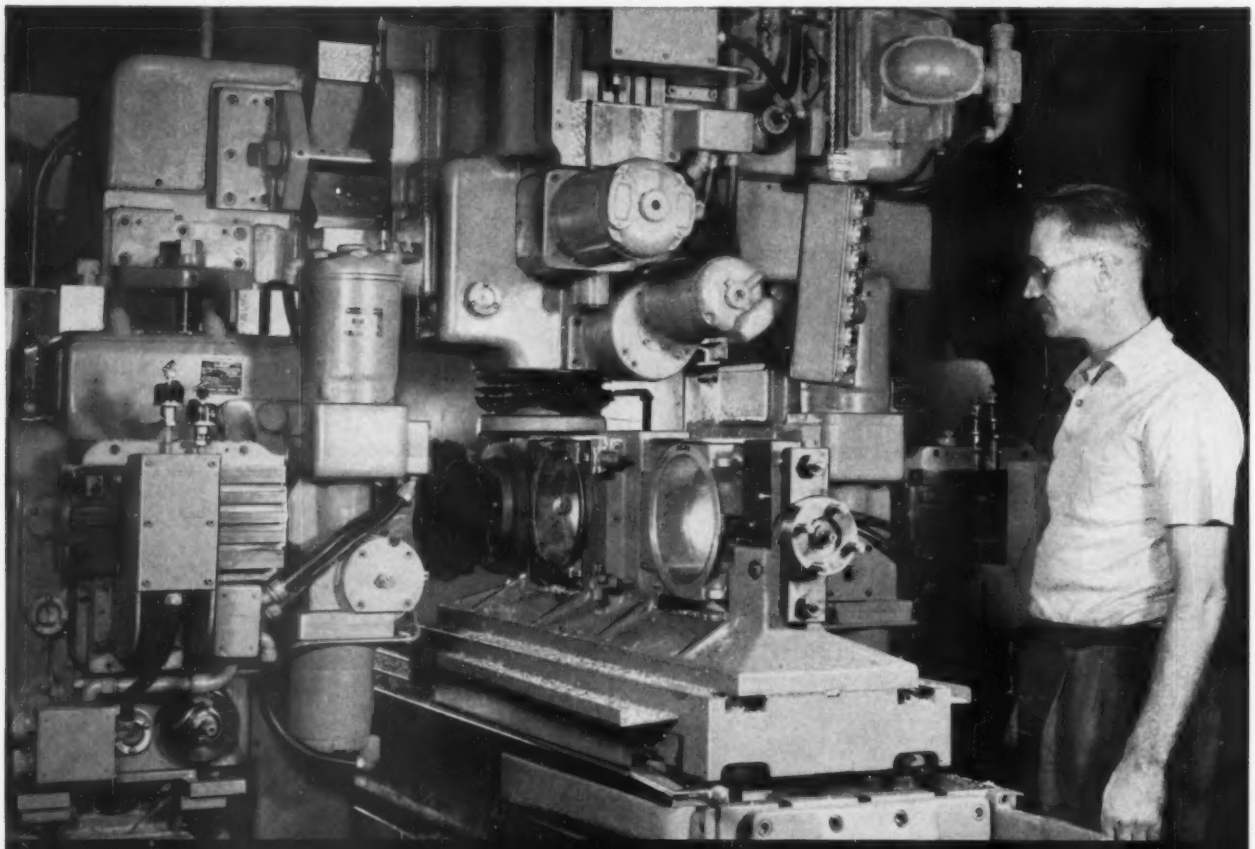
Write for handy folder on Disston hack saw blades. It includes helpful hints to your shop men on the right number of teeth, feed and stroke—for various metals. It can save hours of production time.

Name_____ Title_____

Company_____

Address_____

Mail to Henry Disston & Sons, Inc., 520 Tacony, Philadelphia 35, Pa., U.S.A. In Canada, 2-20 Fraser Ave., Toronto 3, Ont.



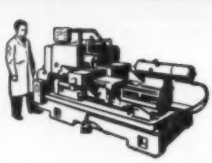
ANOTHER EXAMPLE OF SUNDSTRAND "ENGINEERED PRODUCTION" . . . .

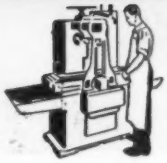
Production Increased from 45 to 110 Pieces Per Hour

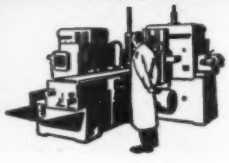
Here's another interesting example of the effectiveness of Sundstrand "Engineered Production" as applied to a milling problem. This Sundstrand Triplex Rigidmil mills 3 surfaces of cast iron gas meter bodies at the rate of 110 pieces per hour.

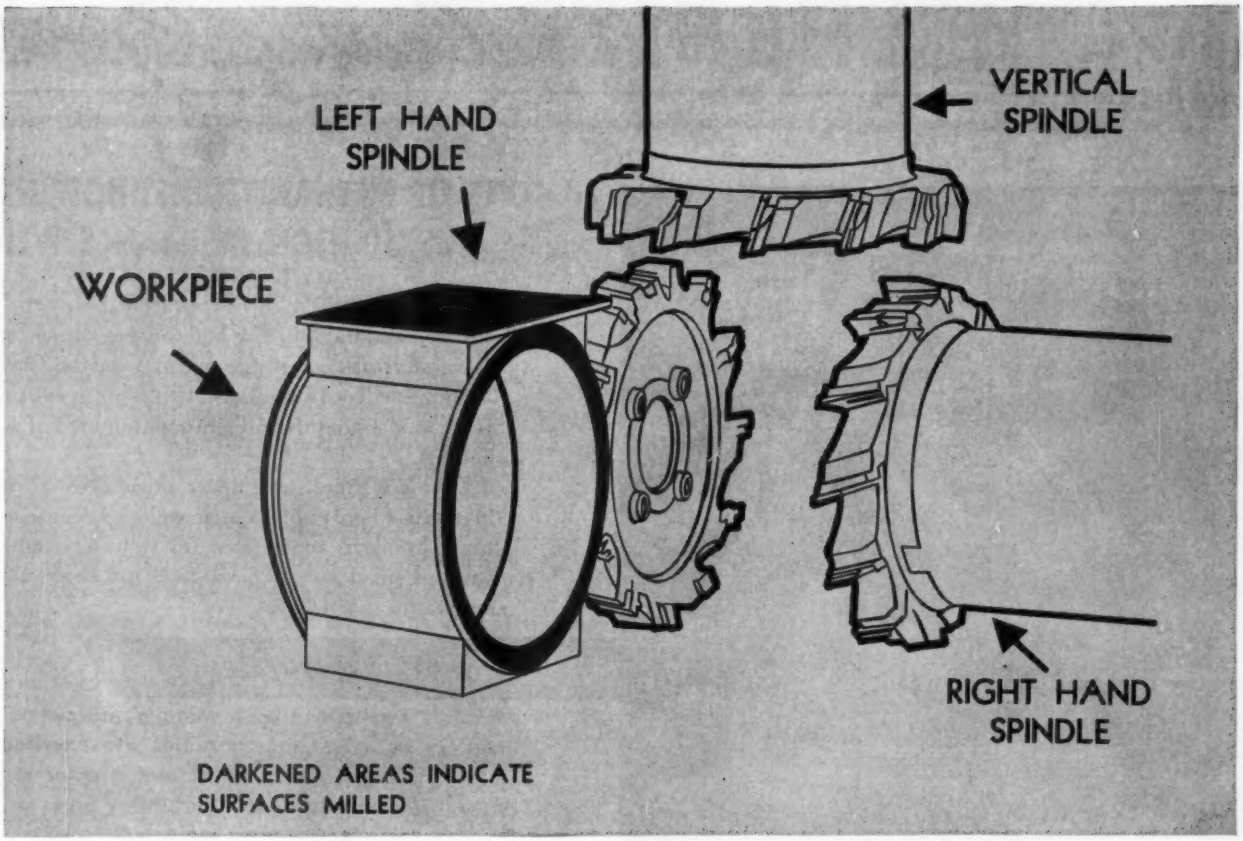
The drawing on the opposite page illustrates the arrangement of the three cutters. The fixture holds two pieces and can be pivoted so that one piece can be milled while another piece is

SUNDSTRAND
50 YEARS OF "Engineered Production" Service*
*REG. U.S. PAT. OFF.
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS









loaded in the opposite station. With this arrangement loading time is free.

Previous production of 45 pieces per hour was obtained from two milling machines with two operators. The Triplex produces 110 pieces per hour with one operator. If you have milling work of this nature investigate the possibilities of the Sundstrand Rigidmils.

For practical solutions to your milling problems use

SUNDSTRAND

"Engineered Production"

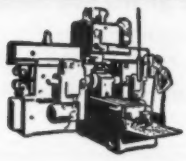
SERVICE. This is but one of countless milling production problems solved through the use of Sundstrand "Engineered Production". For further information about this service call in a Sundstrand engineer. There is no obligation for this service.

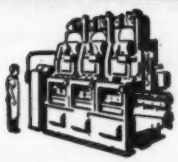
more facts

about milling production are contained in this booklet. Write for your copy today. Ask for bulletin 155.

See Sundstrand machines in action in Booth No. 1412 at the Machine Tool Show, International Amphitheatre, Chicago, September 6-17, 1955.

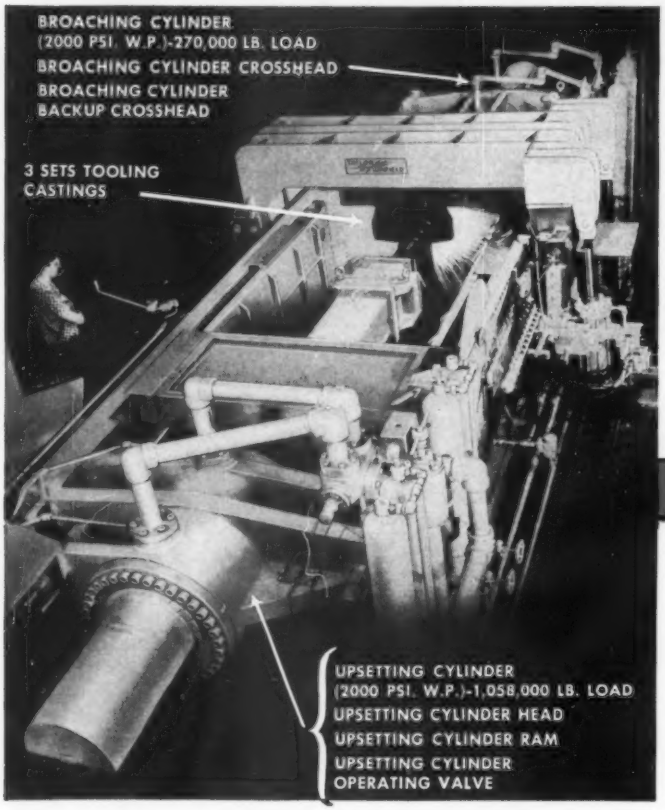
TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

The MEEHANITE® Casting Reporter



20 TONS OF MEEHANITE CASTINGS IN THIS 500-TON RESISTANCE WELDER

The Taylor-Winfield Corporation, Warren, Ohio, engineered and built a 500-ton resistance welder, (largest of its kind in the world), for the Cleveland Pneumatic Tool Company. It has an upsetting load of 1,058,000 pounds and a broaching load of 270,000 pounds.

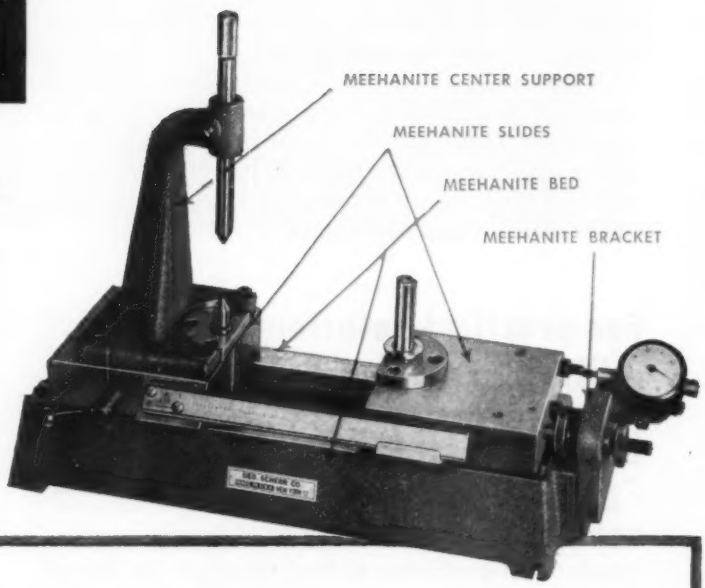
Taylor-Winfield engineers chose Meehanite castings as the heart of this huge welder because of their high strength, their pressure tightness, and their wearing properties. The illustration shows the vital Meehanite parts.

As The Manufacturer Says:

"Due to Meehanite Metal's close or fine grain, the machining qualities are excellent and give us better finish and greater strength. Meehanite's heat-treatability gives us better rams for our press welders."

PRECISION INSTRUMENT MANUFACTURER SPECIFIES MEEHANITE CASTINGS

The George Scherr Co., Inc., New York City, manufacturers of precision measuring and testing instruments, has found that insisting upon Meehanite components in the building of their spur gear tester has resulted in greater economy and in the elimination of assembly and fitting problems.



As The Manufacturer Says:

"The production of this testing machine was engineered completely by the use of Meehanite castings. We needed hardened and ground ways in the bed and, similarly, in both slides. If we had provided these by using hardened and ground steel inserts, it would have made the production of the machine much more expensive.

"Instead, we flame-harden both the ways in the bed and the ways at the bottom of the two slides. As a result, we have no extra assembly or fitting problems, and the finishing of all the guide ways is a simple surface grinding operation."

Industries report what Meehanite Castings have done for them

MEEHANITE COMPONENTS IN HYDRAULIC UNIT SEAL ASSEMBLY

The Twin Disc Clutch Company, Hydraulic Division, Rockford, Illinois, is using Meehanite components to improve performance and reduce maintenance.

The seal nose pieces (Fig. 1) for the Fluid Drive Seals are heat treated after machining. They are brought to a heat of 1580-1610 F 6 to 8 hours and packed in fine carburizing compound to prevent decarburization. They are then quenched in oil and drawn at 400-425 F for 4 hours.

It is necessary that the seal surface be ground and lapped flat within 6 wave bands of green-yellow light (.000069") and have maximum profilo-meter reading of 12 micro-inches.

Fig. 2 shows the seal test stand in operation. On the stand are two Torque Converter Seals using Meehanite castings, the oldest having been run for 7,724 hours at 50 psi and 2,500 rpm.

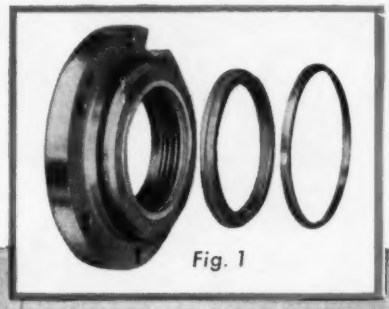


Fig. 1

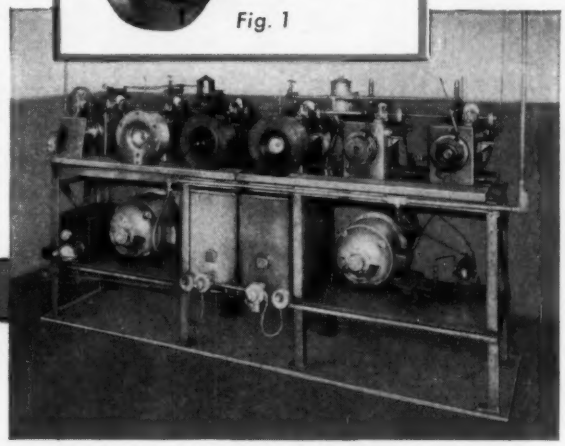


Fig. 2

As The Manufacturer Says:

"Meehanite metal, noted for its high tensile strength, provides many advantages for its use as seals for Twin Disc Hydraulic Torque Converters and Fluid Couplings.

"It has proved to have excellent wear properties and provides very uniform hardness in the heat treating process."

ONLY A MEEHANITE FOUNDRY CAN MAKE MEEHANITE CASTINGS

The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington and Dover, New Jersey
Blackmer Pump Co.	Grand Rapids, Mich.
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The Cooper-Bessemer Corp.	Mt. Vernon, Ohio & Grove City, Pa.
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Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
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Hardinge Company, Inc.	New York, New York
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Palmyra Foundry Co., Inc.	Palmyra, New Jersey
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The Stearns-Roger Manufacturing Co.	Denver, Colorado
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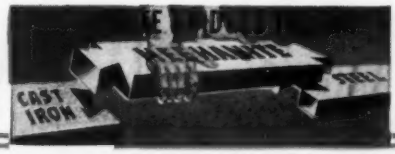

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No question about it—these "robots" were *sick!* Temperature of 194°F...."blood pressure" of 800 psi...constant need of transfusions...erratic motion that made them useless for the precision work they were intended to do.

These robots were two hydraulically-operated, automatic machines in a large auto plant. They were used to face and bore flywheel housing assemblies on engine blocks, and were shut down frequently because of hydraulic valve sticking. To overcome this, the operators had doubled oil pressure in the systems. But this, in turn, resulted in excessive oil leakage and high oil temperature that caused fast deterioration of the oil and further valve sticking. Even complete oil changes every two weeks did not eliminate this trouble.

Socony-Vacuum men tackled this problem. Working with plant personnel, they studied the operations. A carefully designed program of lubrication was put into effect. This cure worked. Oil temperature dropped, and the valve sticking ended. Machine operation was smooth. Parts met precision requirements. Savings have already amounted to $7,600!

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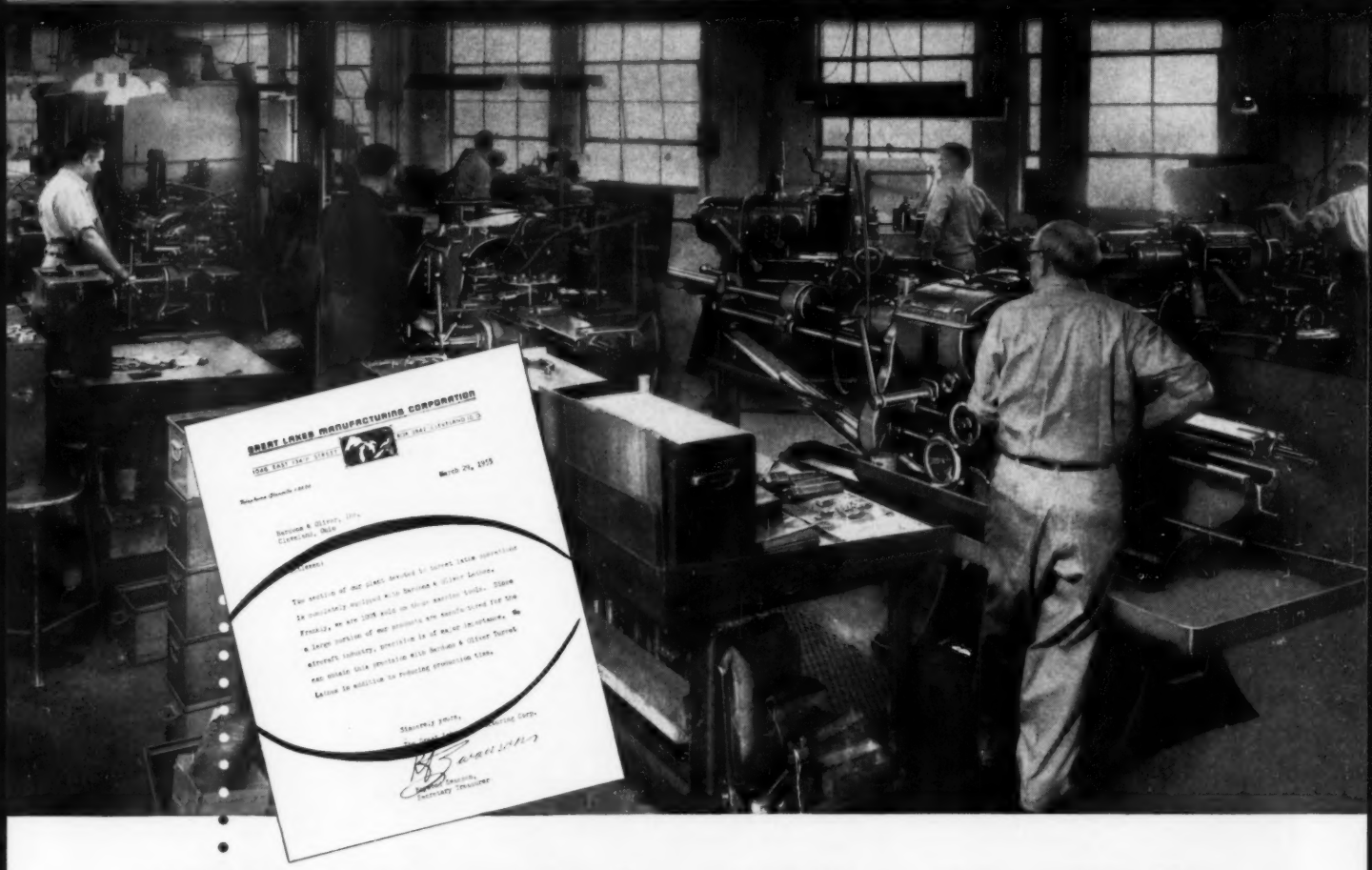

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Gentlemen:

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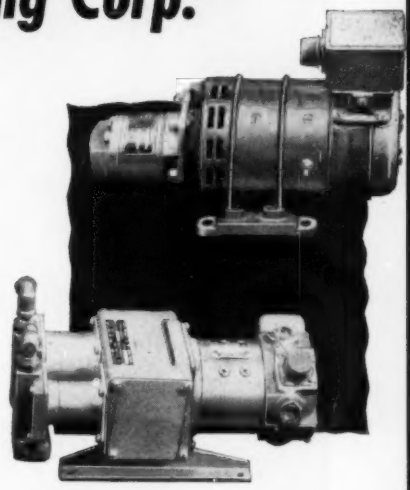
Sincerely yours,
The Great Lakes Manufacturing Corp.

Raymond Swanson,
Secretary Treasurer



The illustrated motor driven hydraulic gear pump and two stage air compressor are products manufactured by The Great Lakes Manufacturing Corp., Cleveland, Ohio.

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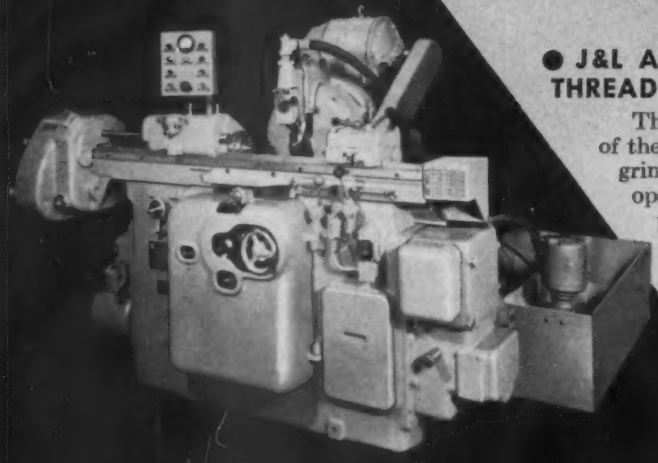
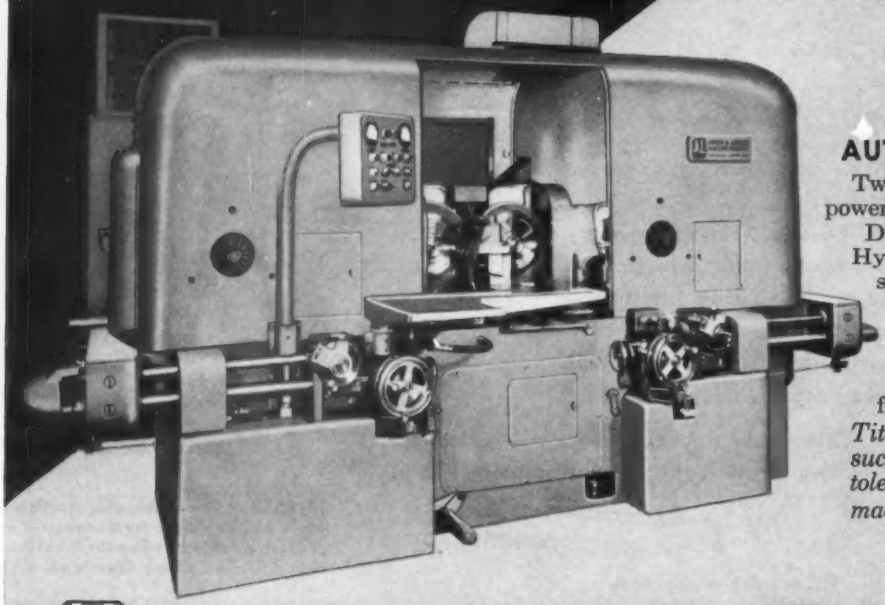


● J&L AUTOMATIC THREAD GRINDER

The self-trueing, self-sizing mechanism of these machines has made thread grinding a practical, profitable production operation. They can be arranged for plunge grinding single or multiple grooves or contours, and for grinding threads with multi-rib wheels, either diamond or crush dressed.

MODEL E AUTOMATIC FORM GRINDER ●

Completely automatic cycle. High speed approach, wheel feed spark-out and withdrawal are positively controlled through simple cam action, ensuring constant, uniform operation under all conditions.



● MODEL D DUO WHEEL AUTOMATIC FORM GRINDER

Two 20″ dia. grinding wheels, powered by 20 HP A.C. motors, or D.C. with rheostat control. Hydraulically operated vertical slide, mounts work holding fixtures. The stroke may be adjusted to accommodate a variety of work. These models are equipped with full vapor control.

Titanium alloys have been successfully ground to tolerances with this machine.

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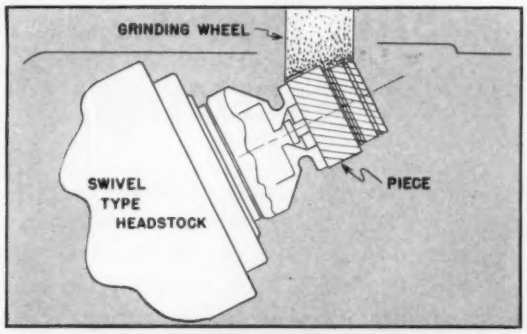
and greater accuracy?

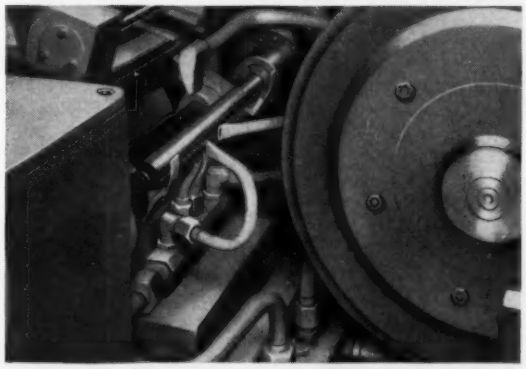
...why not GRIND IT?

Newly developed materials, plus the constant demand for higher production and greater accuracy, are causing industry to step up its search for better methods of producing a great variety of work. In many instances it is found that Automatic Thread and Form Grinders can perform a great many different and difficult production jobs with greater speed and precision than was ever possible with the use of conventional equipment.



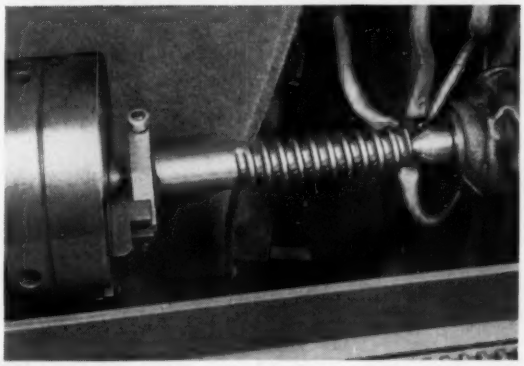
ANGLE GRINDING

This piece is held on an angle by an expanding air-operated arbor in the swivel type headstock of the J&L Model E. Four diam. are ground in one pass with a single wheel.



AUTOMATIC HANDLING

J&L Grinders are readily equipped with automatic handling for maximum output along production lines. This machine has a magazine feed for automatic loading and unloading of parts to be plunge ground for the automotive industry.



STOCK REMOVAL

J&L Wheel Spindles — grease packed for life, allow heavy stock removal such as on this worm (dia. 1.141″, stock removed — .1235″). Plunge ground from the solid — one cut. Increased production 160% over previous method.

P.S. On the basis of increased quality and more production per labor hour, we invite the opportunity to improve upon your existing methods.

MACHINE TOOL DIVISION

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Please send me the J&L Machine Tool Replacement Information Kit.

Name .....

Title .....

New SKIL Shear Sweeps Field in Actual Comparison Tests!

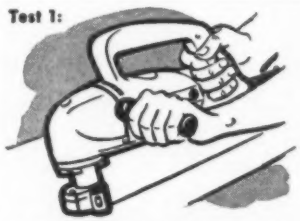
SKIL Model 231 Wins 5 Trials Out of 5 Outperforms, Outproduces All Others

Production men are voting quick approval of this superb new SKIL Tool. Already its superiority is earning more and more recognition for the 231 Shear as a real asset in the plant. Fast, clean *performance* slices important time off key production cutting. Versatility lets you do more kinds of jobs than other shears. And, *down-time* is kept *to a minimum* because of a design that greatly simplifies maintenance.

Actual tests, rigidly conducted, prove what many sheet metal men are learning for themselves. The new SKIL 231 Shear is far superior to all others on the market. These tests show the speed, power, and control that are making the SKIL Shear so popular on every job . . . in every shop.

Here are actual results of impartial tests of the SKIL Model 231 Shear and competitive brands. Shown are performance figures for SKIL, Brand A, and Brand B. In every case, SKIL superiority speaks for itself!

Test 1:

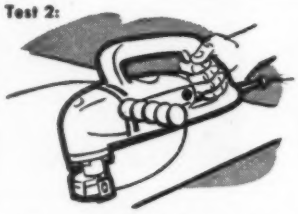


25" Trial Cut of 12 Gauge Metal

Model 231.....9.2 seconds
Brand A.....15.3 seconds
Brand B.....12.0 seconds

A good reason for SKIL's higher production rate.

Test 2:

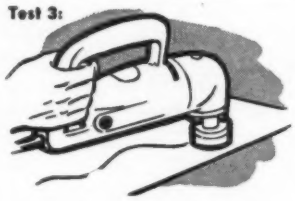


Cutting Right and Left Hand Circles

Model 231.....22.0 seconds
Brand A.....24.0 seconds
Brand B.....22.2 seconds

SKIL leads on both right and left hand cuts.

Test 3:

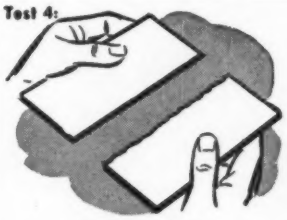


Small Diameter of Circle Cuts

Model 231.....1½"
Brand A.....2"
Brand B.....2½" (right hand)
Brand B.....4½" (left hand)

SKIL leads on small diameter cuts.

Test 4:

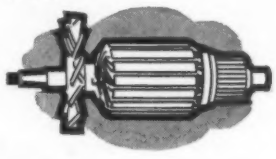


Cleanness of Cuts

RATING
Model 231.....Excellent
Brand A.....Good
Brand B.....Poor

SKIL consistently cuts cleaner.

Test 5:

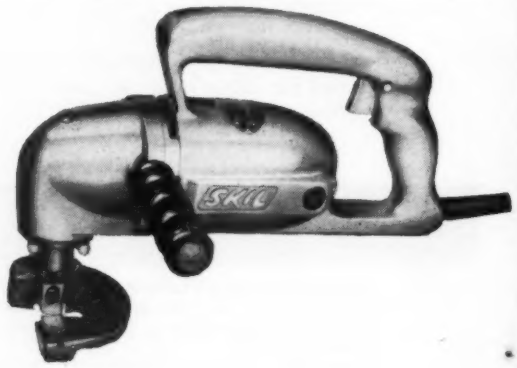


Power and Performance

Model 231.....40% more powerful
Brand A.....than Brand A, 33⅓%
Brand B.....more than Brand B.

SKIL SHEAR 231— Best All-Around

These tests prove Model 231 the best all-around shear on the market today. Faster, easier handling, more powerful! Features like the Contour Grip Handle at the rear of the tool make it a favorite with workmen who have tough cutting to do. Improved foot design keeps maintenance costs down for job superintendents. This is the shear you need in *your* shop. The SKIL Model 231.



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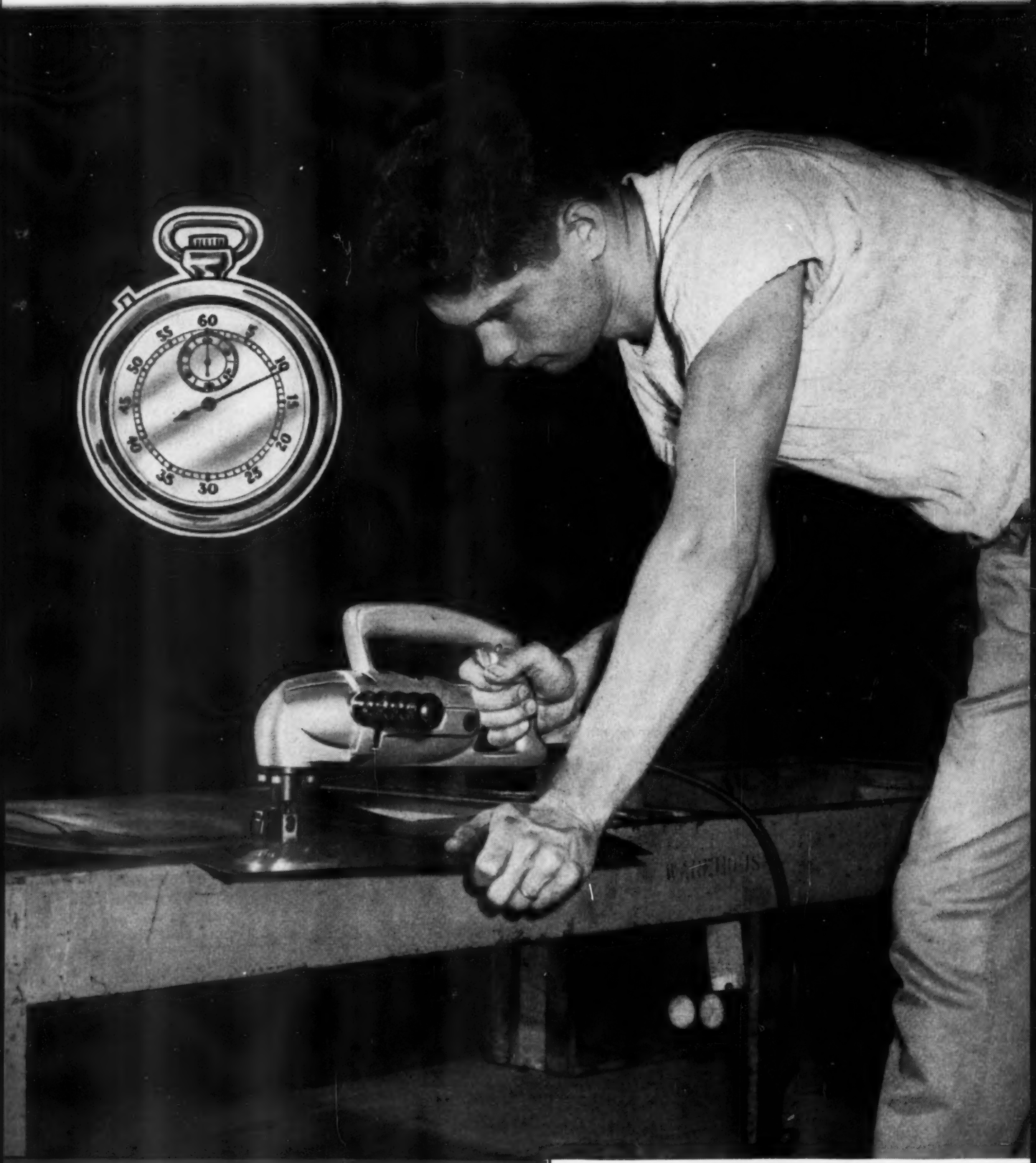

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☐ Please send literature on New SKIL Shear.

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...your cutting tools MUST be kept Sharp and Accurate
—equip with an OLIVER "Automatic" Face Mill Grinder

Automation CAN bog down if your cutters are not kept sharp and accurate. The thrifty Oliver is simple to operate (one man can easily run several machines at a time) . . . yet it grinds a greater number of accurately-ground milling cutters per hour than ordinary face mill grinders.

The efficient Oliver automatically indexes and machine grinds each tooth in succession until the entire cutter is completely and accurately ground. The shape of the tooth is determined by inexpensive, easily replaceable, hardened cams.

The lasting accuracy of the OLIVER "AUTOMATIC" FACE MILL GRINDER is assured . . . at each stroke the wheel passes over a fixed diamond compensating for wheel wear. This unique Oliver feature enables tungsten-carbide and high speed inserts to be easily and rapidly ground to any degree of accuracy and quality of finish.

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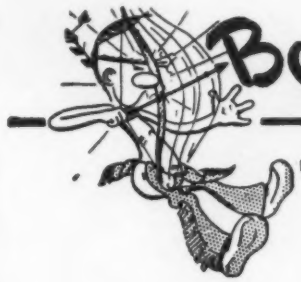


Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Oversimplification

In your current issue (*AM*—Mar 14 '55, p127) you show a drawing of a die dimensioned in the so-called conventional way. I do not know whether this is a genuine drawing, or whether it was cooked up specially for this article. If the former, then the draftsman "J.M." should have been fired, or a least sent back to school to learn the first principles of dimensioning. If you made the drawing up yourselves, you should be ashamed of yourselves.

No draftsman with any knowledge of dimensioning would ever dimension consecutively. In all my 25 years of practical drafting, both here and in Europe, I have always followed the standard practice of dimensioning from a single reference point. Doesn't J.M. realize that the center distance between the holes in the corners on his drawing can be off as much as 0.050 in.?

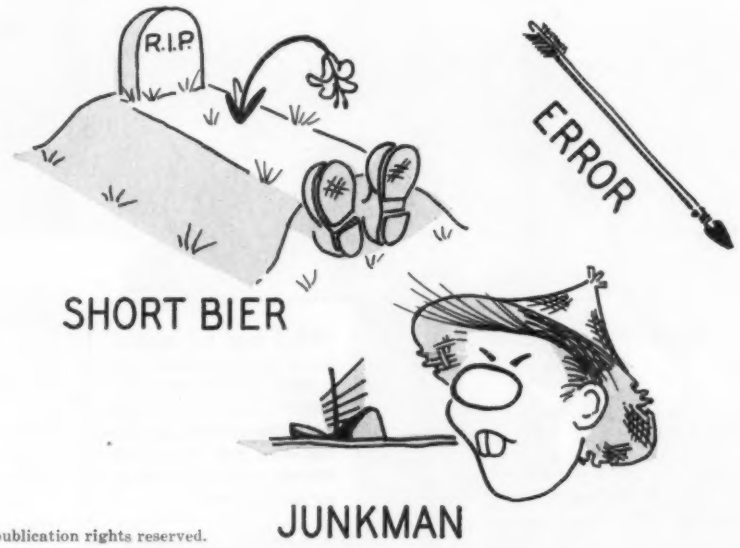
Furthermore, the old-style drawing shows that the holes marked "C" on the new drawing are to be spaced to limits of plus zero, minus 0.001. Obviously this is a critical dimension. The new drawing, however, positions these holes from a reference edge with a plus or minus 0.001-in. limit on each. Thus the center distance could easily vary by as much as 0.002 in. which would be outside the required limits.

I am not saying that there is anything wrong with the idea of simplified drafting, although it would take some getting used to. But I am saying that it cannot be used "ad absurdum" as you have shown it. There are many cases where center distances are much more critical than location. And there are cases where distance from the center line can well be critical. This simplified system no doubt has its place, but it is not a cure-all and will not fit every sitation.

As an additional complaint, I would say that you are making an unfair comparison between a simplified drawing and one that should never have been drawn that way in the first place. And you are making it harder to compare the two by showing drawings of two slightly different dies. One of them, for instance, is 12½ in. long; the other is

GRINETICS

By D G SMITH



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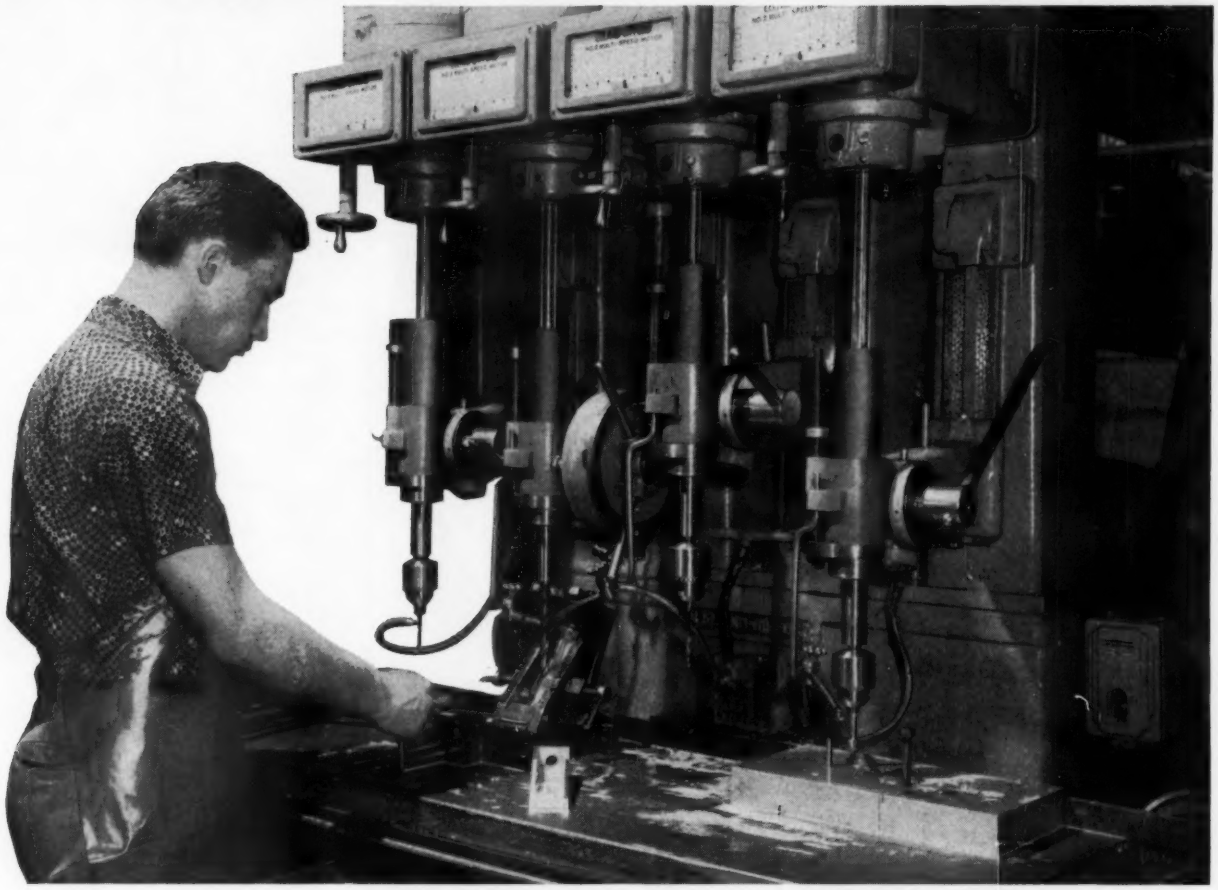
at Douglas Aircraft Company.....



they DRILL, REAM, TAP, SPOT FACE in any combination...with instant speed changes

At DOUGLAS AIRCRAFT COMPANY, El Segundo Division, the new Torrance Facility is rated a "dream" shop. Ideally laid out for precision mass production of aircraft parts, it is completely tooled with modern equipment selected on the basis of proven performance.

Throughout the shop, Leland-Gifford Multiple Spindle Drilling Machines handle a wide range of operations — drilling, tapping, reaming, spot facing — and provide the complete flexibility and fast speed changes necessary to expedite work flow regardless of the number or size of holes, or the combination and sequence of operations.

Particularly advantageous in rapid handling of precision work are the centralized controls and built-in safeguards against costly errors featured on Leland-Gifford Drilling Machines. With the Leland-Gifford *Indicating Shift*, for example, changes in spindle speed are indicated on a chart of drill sizes and cutting speeds. Changes are made by a hand wheel without stopping the machine.

Compare new Leland-Gifford Drilling Machines with your present drilling equipment. See how many ways you can improve production, lower costs. New bulletins give complete information. Write for them.

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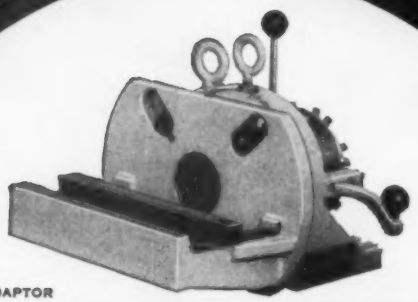
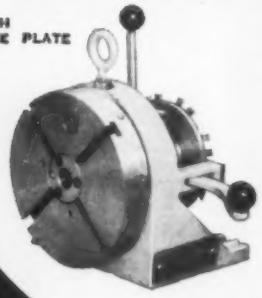
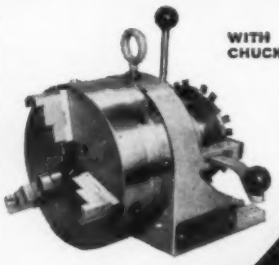
"...one of the most useful pieces of equipment in metal working plants throughout the country."



WITH RIGHT ANGLE ADAPTOR



WITH FACE PLATE



WITH CHUCK

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Gives new, *simple* mounting of work or jig plus rapid, controlled rotation to correct angular positions. Used on radial drills, boring mills, planers, milling machines, and sensitive drills.

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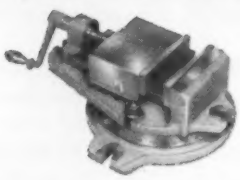
Request Bulletin J7 for complete details.



STURDY, ACCURATE machine vises, made with more than the usual care. Available with or without calibrated swivel base.

UNIQUE, SIMPLE work holder for indexing and positive clamping of difficult parts in milling or pantograph operations.

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JOHNSON & BASSETT, INC.

PRODUCTION TOOL DIVISION

WORCESTER, MASSACHUSETTS

12⅛ in. Also, you do not mention the purpose of the letter T in the upper left corner of the simplified drawing. I assume it to be the reference point. But why not say so? And why did you omit the counterbore in the top right hole of the conventional drawing when it is specified in the note?

H Waring
Hawthorne, NJ

But They're Waiting.....

In Backlash (*AM*—Mar 28 '55, p 90) Mr John J Lange of West Hartford, Conn, points out the fact that we have overlooked many factors in our apprentice article (*AM*—Feb 14 '55, p 137).

All of the points enumerated by Mr Lange have, of course, been repeatedly discussed in meetings and in articles as important factors of an inadequate apprentice-training program. The fact remains, however, that most of these points have become matters of secondary importance, and our greatest and seemingly most important problem is the fact that there are not enough shop owners who are willing and able to train apprentices. The waiting lists for apprenticeships in most of our tool centers testify to the fact that all the other objections have been overcome or minimized, and while I respect the opinions of Mr Lange, I think he has not been brought up to date on the facts of apprenticeship training.

I think John Wright and Robert Sheets have done an excellent job in preparing this article, and have presented a true picture as it exists in our industry today.

J Kleinoder
Volkert Stampings, Inc
Queens Village, N Y

In replay to reader Waring's first question, the drawings illustrated were real, actually taken from company files. In regard to the apparent errors, the two parts were similar, but not identical. It was necessary to find two similar parts to make the time studies valid, but it would have been wasteful to redraw an old part needlessly for the purpose of manufacturing a comparison. We can assume, from the discrepancies in the new drawing, that some trouble must have been encountered in the shop; but that may have been straightened out on the floor and changes made later in the drawing to suit. The main point — simplified drawing—was, we think, adequately illustrated.—Ed.

A Step Forward or Backward?

For the last several years a number of universities have been toying with the problem of what to do to improve their engineering curricula. Technological changes have prompted much of this tendency.

In the past, engineering schools have taught manufacturing processes and methods along with some actual machine-shop training. With this education, a graduate is better equipped to move from the university into industry than if no practical courses were taught. Because he has operated many of the present-day machines and handled the tools with his own hands, he has learned at first hand the common production problems. He is therefore a valuable man to the company that hires him.

The men now in tool engineering and industry in general will be painfully surprised to learn that many of our best universities are eliminating "practical training" courses, and are teaching only engineering sciences.

The trend today indicates the following:

1. More emphasis on scientific courses
2. More emphasis on higher mathematics — above differential equations for undergraduates
3. More emphasis on advanced physics courses — nuclear energy, nucleonics, and the like
4. Less emphasis on shop courses
5. Less emphasis on drafting
6. Trend to eliminate some of the practical courses (welding, heat-treating, machine shop) hoping that industry will make up the loss

When a job such as a military order is to be tooled up in a short time, theory alone will not do the job. It takes a combination of engineering science and practical know-how to do the job well and fast.

The most valuable new weapon is of no use on paper. It takes the tool engineer with plenty of knowledge to turn the dream into a reality. Then is the time that the practical as well as theoretical know-how pays off.

Industry knows that it needs more engineers. College graduates with the all-important theory and with a good foundation of practice have the best opportunity. Most of the larger manufacturers have set up their own training systems, which consist of both theory and practice. The fact that industry spends so much on its own combination of theoretical and practical training is perfect proof that a graduate of engineering science alone will have trouble hiring into industry at the salary he expects.

Name Withheld

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Ask your distributor for Gorham "standards." For "specials," call in your nearby Gorham Field Engineer. They're both well qualified to help you . . . and backed by unmatched experience and facilities. For profitable solutions to milling problems, call on Gorham! There's no obligation.

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Electrical System Fact—Only the new Life-Line "A" motor gives you the unsurpassed corrosion-resistant protection of exclusive new Bondar, Bondite and Mylar* insulations.

*Du Pont Registered Trade-Mark

FACT:

The new Life-Line A is the most corrosion-resistant motor on the market

The corrosive action of chemicals takes a heavy toll on conventional motors. The new Westinghouse Life-Line® "A" motor offers more protection against corrosive atmospheres than any other motor you can buy. How?

Because the combined improvements in insulation, housing and bearing design give unsurpassed protection against any contamination. It takes the right combination of such improvements in *all three systems*—electrical, mechanical and lubrication—to make the Life-Line "A" industry's most preferred power package.

Get all the facts by calling your Westinghouse sales engineer . . . *The Man With The Facts.*

J-21881

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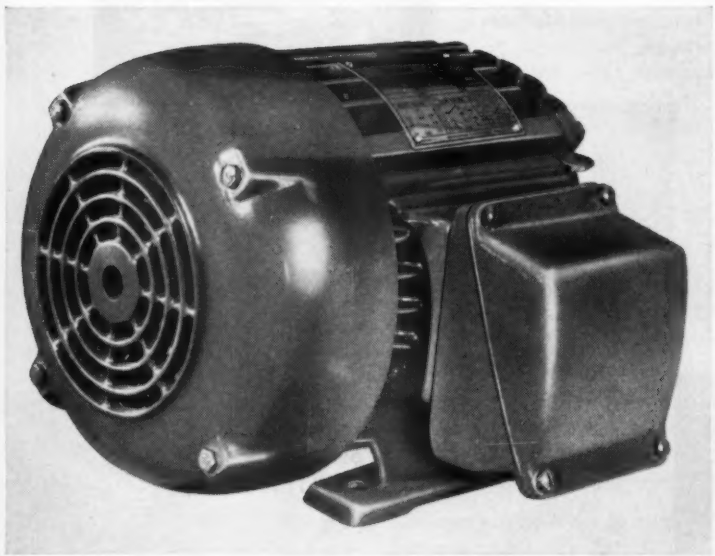
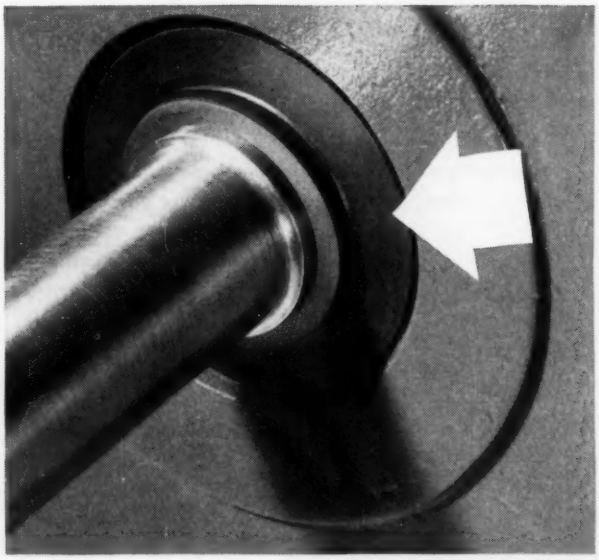


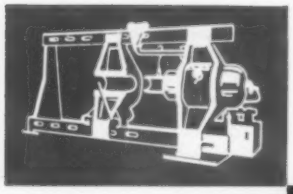
Mechanical System Fact—New cast-iron frames and brackets utilize the finest grained castings with uniformly thick wall sections precisely fitted and sealed. Molded glass plastic cooling fans on totally-enclosed types are chemically inert.



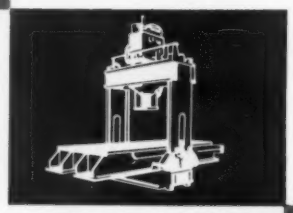
Lubrication System Fact—The new pre-lubricated Life-Line "A" bearing features a "4-way seal"—*two* seals on each side. Totally-enclosed types have additional neoprene flinger which assures bearing protection in any corrosive application.

Elmes...

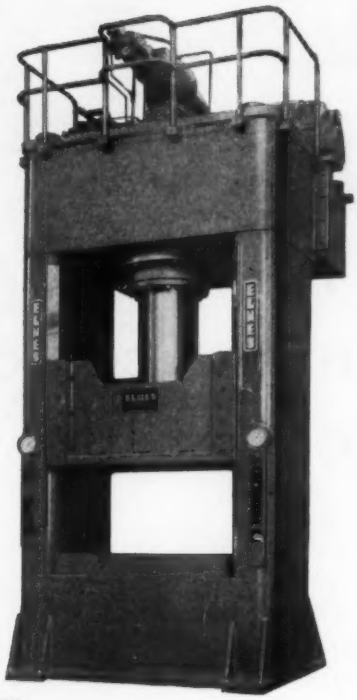
builds hydraulic metalworking presses to meet *your* production requirements—exactly



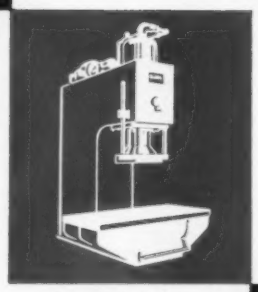
Inclined Forcing



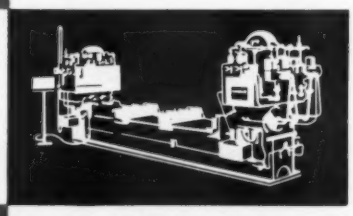
Traveling Head Straightening



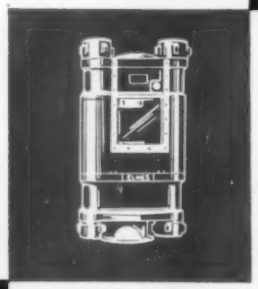
Drawing and Forming



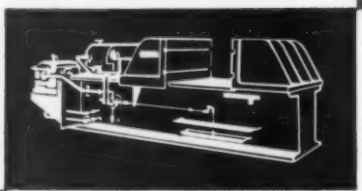
Openside C-Frame



Tube Reducing



Hobbing



Horizontal Bulldozer

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Spot News of Metalworking . . .

92% of post-Korea Metalworking plant expansion is now in place, Office of Defense Mobilization reports. The agency has issued 1348 fast tax write-offs to Metalworking plants covering $249-million expansion.

A machinist who lost his job in a closed shop for refusing to join a union has been turned down for New York State unemployment pay. The N Y Supreme Court ruled the action constituted resignation "without good cause . . . amounting to a voluntary refusal to meet a condition of the work."

U S Air Force is dickering with Italy's Fiat for (1) assembly of F-86K jet fighters, (2) repair and overhaul of J-47 aircraft engines, and (3) production of three NATO prototype light fighters, and 27 other aircraft.

You have to keep close control on hydrogen when working with titanium, and cooling fluids are more effective than cutting oils when working titanium. That's the sum and substance of two new Office of Technical Services reports — one on hydrogen and titanium detailing research results at Battelle Memorial Institute, and one on cutting oil research by the University of Michigan — both undertaken for Army Ordnance.

Boeing has been ordered to rehire three employees fired in 1948 for strike activities. And NLRB, backed by the Federal Court of Appeals, has ruled Boeing has to pay them lost wages.

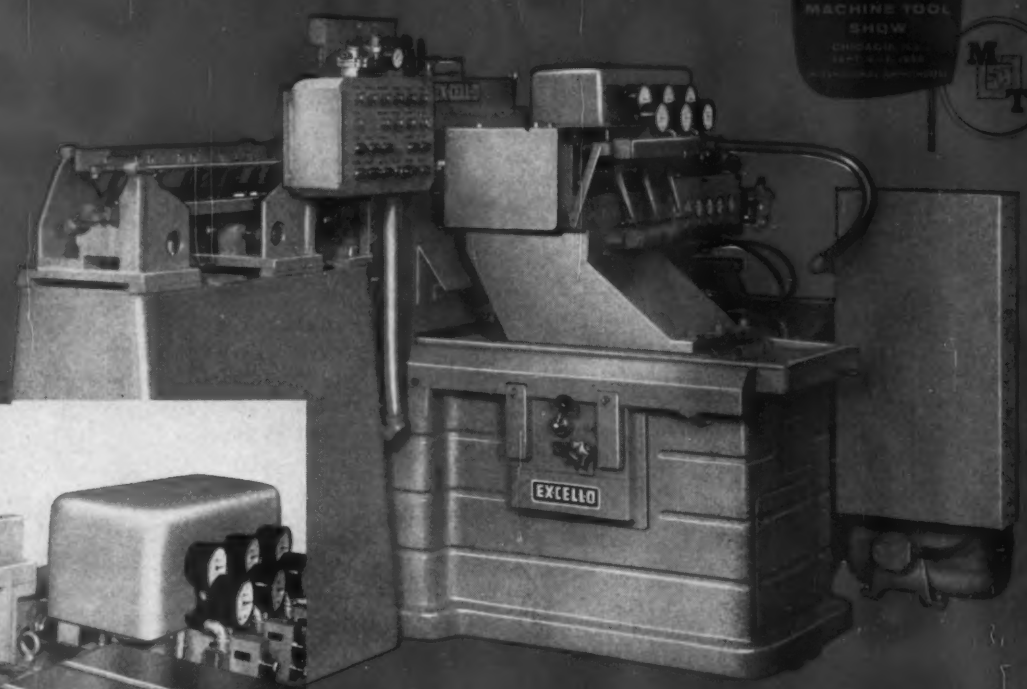
New crack-free chromium plating process eliminates need for a copper or nickel undercoat in plating chromium on steel. United Chromium Inc developed the process, which will go into first production use at the Maytag Co, where a fully automatic machine will plate washer and dryer parts (p181).

Canada's AFL-TLC Machinists' Union has banned all overtime at Avro Aircraft and Orenda Engines in Malton, Ont, and fines any union member who works overtime $10 an hour. Reason: the union wants to spread work around in the two plants, which have had frequent layoff periods.

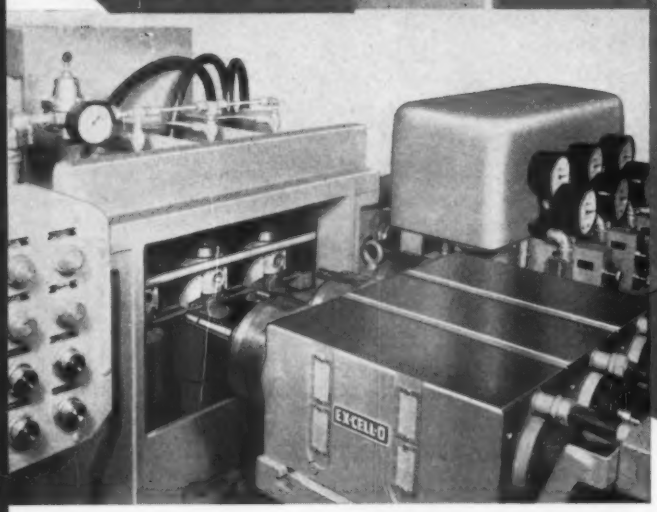
A 100,000-ton forging press that could form the first complete one-piece aircraft wing structure should be built under the Air Force Heavy Press Program — if the 50,000-ton presses slated for operation this summer work as well as the 35,000 tonner at Wyman-Gordon's North Grafton, Mass, plant. That's the opinion of some top Air Force people and press builders.

Krupp of Germany will start Europe's first titanium processing plant this spring at Essen. Monthly output is slated at 3 tons.

Any ideas how the Air Force can cut production costs? Air Materiel Command will welcome manufacturing and design cost-cutting ideas from any of its suppliers (direct or indirect), and is launching a national campaign to root out pet ideas (even Rube Goldbergs) that could be of value.



Style 112-C Ex-Cell-O Precision Boring Machine equipped for automation. Operations: Transfer mechanism moves three parts at a time from conveyor to fixture, to gaging station (optional), back to conveyor.



Net production is 300 pieces per hour. Three pistons are machined simultaneously by three motorized spindles each carrying semifinish and finish boring tools.

Standard EX-CELL-O Machine Equipped for AUTOMATION

FAST, ACCURATE PRECISION BORING OF WRIST PIN HOLES

Pistons are brought automatically from the conveyor to boring position, three at a time. Operations are fast and accurate, producing a fine finish.

Automatic Inspection equipment may be incorporated, with lights to indicate size limit warnings and rejections; a rejection stops the machine.

Call your Ex-Cell-O representative or write Ex-Cell-O in Detroit for complete facts on this or similar production savings opportunities through automation.

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- DAIRY EQUIPMENT

55-12

Washington . . .

Renegotiation renewal . . .

House of Representatives has voted a two-year extension of the Renegotiation Act. That's the first hurdle. Passage by the Senate is now a certainty. No public hearings on the bill have been held, nor are hearings scheduled by the Senate.

The extension bill clarifies an exemption made last year — that "standard commercial items" produced under competitive price conditions for Naval vessels and military planes are not subject to any profit renegotiation. Treasury Dept ruled earlier that removal of such items from the Renegotiation Law put them under the tighter profits-recapture clause of the Vinson-Trammel Act.

Air Force contractors . . .

The Air Force has revealed the dollar volume of government business for its top contractors in 1953. Here is the list: Boeing, $917 million (nine month period); Convair, $307 million (now part of General Dynamics); Douglas, $770 million; Lockheed, $755 million; North American, $623 million; Northrop, $184 million; United Aircraft's Pratt & Whitney, $434 million; GM-Allison, $430 million; Curtiss-Wright, $303 million; GE's AGT Div, $553 million; RCA, $168 million; Westinghouse, $391 million; Bendix, $505 million; Kearfott, $40 million; Kollsman Instrument, $30 million; AVCO, $200 million; Sperry, $250 million.

Tool leasing . . .

ODM has submitted a report to the Joint Congressional Committee on Defense Production, claiming that government tool lease rates are comparable to lease rates charged by private machine tool firms. It's based on a recent study by AMTDA.

The study showed that commercial rates range from 7% to 33 1/3%, that the average is from 12% to 19%, increasing with the length of the lease. Government lease rates have been usually 1% monthly of the acquisition cost. According to ODM, this charge expressed in terms used in the industry study — simple interest per annum — results in a rate of 16.3% for a typical five-year lease of government equipment.

Production reserve policy . . .

The Air Force has told Congress that dual-purpose plants "have not proven feasible on a broad scale" for mobilization planning purposes. But in some instances inactive production lines are still maintained in non-military plants. Examples cited: Delco Products, Dayton, Ohio, to produce struts; National Cash Register, same city, fire-control equipment; A-C Spark Plug, Milwaukee, fire-control equipment; Pryor Manufacturing Co, Dayton, wheels and brakes.

Aircraft plant dispersal . . .

Air Force will block construction of new aircraft and guided missile plants on West and East Coasts. Secretary Talbott says new plants must be built inland away from critical target areas.

Actually, it has long been government policy to disperse strategic defense plants. But up to now, the policy hasn't been pushed too hard. Main gimmick has been to use fast tax writeoffs to put new defense plants outside the important target areas. In addition, there's a Pentagon directive providing preference to contractors dispersed from strategic regions. This, too, hasn't been carried out very firmly.

Talbott's new statement, though, makes it obvious that Washington is now taking plant dispersal seriously — especially on jet planes and guided missiles. The statement was made to clarify what Talbott had told a Congressional committee earlier — that aircraft concentration in Southern California is "dangerous" for military and economic reasons.

Los Angeles Chamber of Commerce jumped on Talbott's testimony, asked whether Talbott was also seeking reduction of steel output in Pittsburgh or auto production in Detroit.

Talbott explains his position this way: there's no idea of reducing activity in Los Angeles or places like Baltimore and Seattle. The aim is simply to keep new plants that will be coming up away from the big coastal target cities. Big West Coast aircraft makers like Douglas, Lockheed, North American, Boeing, and Convair now have inland "second" plants. Idea now will be to push this further.

Boeing, for example, is now seeking a Midwest site to build the Bomarc missile. If North American will need a new plant to build the Navaho missile, the Air Force won't let the firm locate on the West coast.

Guided Missile Program is one in which military spending will rise in coming years. Air Force will spend $272 million on missile production in fiscal 1956, $105 million on research and development. Orders for $700 million worth of missiles will be placed for future delivery. Air Force doesn't think, however, that new plants will be needed right off.

Trade bill breaks through . . .

President Eisenhower has gotten almost everything he asked for in his Reciprocal Trade Program. The Senate Finance Committee was the strong hope of those who wanted to put strings on the President's authority to reduce tariffs — and the so-called protectionists appeared to have gained some strong new allies among the Southern Democrats.

But the committee amendments were virtually 100% what Eisenhower wanted — they kept the law at three years, they gave the President what he asked for in cutting authority, and the President's freedom was not trimmed by the Tariff Commission.

The man who needs a new machine tool and doesn't buy it is paying for it anyway...

in extra operations

INDUSTRY lives with a continuing demand for higher performance and smoother, trouble-free operation of its products. Hence the need for closer tolerances and higher precision of parts, usually achieved through added production line operations and attendant higher costs.

Offsetting this trend toward added operations, Microhoning brings profitable relief. This unique process of controlled abrading can often replace two or more machining operations. Microhoning thus not only removes stock and generates geometric accuracy, but also insures dimensional precision and develops desired functional surface finish—all in one simple, automatic operation.

Why not analyze your processing operations to see how Microhoning—the machining process of multiple benefits—can eliminate some of the extra operations now causing you headaches and boosting your costs? In extra operations you may be paying right now the price of the new Microhoning equipment you don't have.

PART:
Diesel Fuel Injector Body. Long, small diameter bore must be straight and round.

PROBLEM:
To reduce high cost of operations required to generate accuracy.

SOLUTION:
Microhoning—Three operations replace six—size held to .000090 inch, finish 8 to 12 Microinches r.m.s.

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Ford's $625 million . . .

Where will the $625 million Ford plans to spend in the next three years go?

For one thing, it's not all "brand new" money —in other words, like GM did in its $1 billion estimate of capital spending made a year-and-a-half ago, Ford has included money already committed to such previously announced projects as a new office building in Detroit, and a new chassis parts plant and proving grounds at Sterling, Mich.

And it's pretty certain much of the money will go for these projects: at least one Lincoln assembly line, more automatic transmission capacity, and at least one assembly plant for Ford's forthcoming new car line, now referred to as the "Model E." And Ford will need manufacturing plants to back up the new assembly operations. This could mean another engine plant, and possibly new stamping and forging facilities.

But anyway you look at it, $625 million means Ford has a lot of confidence that today's unprecedented auto output is here to stay.

Mutual assistance pacts . . .

. . . among autodom's smaller companies are being nullified. Last fall, George Romney, president of American Motors Corp, was talking rather hopefuly of developing a program of "product reciprocity" among smaller companies. (*AM*—Oct 25 '54, p105). Object: to improve the productive position of the Little Three with relation to the Big Three.

Most important illustration of product reciprocity has been AMC's use of Packard-built V-8s and Packard's automatic transmission in Nash and Hudson cars. With no V-8 or automatic transmission facilities of its own, AMC found it expedient to buy those components from Studebaker-Packard.

During the press tour of AMC's body, engine and assembly plants in Milwaukee and Kenosha, Wis, Romney said that AMC is undertaking a $60-million product development program, the expenditures to be made over the next 18 months.

While Romney did not say so, it's known that the major part of the money will go for new engine production facilities. Romney, in fact, said "We'll continue to buy engines from Packard. I have no announcement (about engines) to make."

But other sources say AMC has developed and is testing a V-8 which may be ready for installation in 1957 models—a definitely speedy and possibly over-optimistic prediction, since no tooling program is yet underway, as far as is known. At any rate, AMC's plans to provide its own V-8s puts product reciprocity to rest. It seems to have been only a one-way street, anyway. A Packard spokesman says S-P has bought "nothing of significance" from AMC.

Another chunk of the $60-million may be used to increase Rambler production facilities, according to Romney. Presently, the Rambler lines are accounting for half of total AMC car output, which was nearly 26,000 units in March. That possibly will involve new financing. AMC thus far has drawn $29 million of a $72-million line of credit. In noting that Nash and Hudson dealers "have an adequate stock" of cars, Romney became probably the first auto executive to admit publicly that his company could meet customer demand. Most other executives periodically report that such-and-such a car maker is far behind the productive pace needed to fill all orders. And tremendous sales this year tend to substantiate a good many such claims.

AMC made labor news, too . . .

When CIO's Auto Workers Union, now in GAW negotiations with AMC, asked the company to extend the present contract to August 12, the company agreed to the extension. Its contracts would have expired June 1 and July 1. UAW's reason for asking contract extension was clear: as previously noted, the union has been dragging its heels in AMC negotiations because it wants to establish a GAW pattern at Ford and General Motors before demanding guaranteed wages from the smaller companies with which it bargains.

This, in spite of pleas by Edward L. Cushman, AMC's director of industrial relations, that the smaller companies cannot be expected to assume a pattern settlement in this round of negotiations because of inability to match the Big Three, labor costwise.

The Little Three, parts suppliers and other smaller firms may not be asked to meet the exact terms of any contract that Ford or GM may sign, however. Some unionites have suggested GAW "pools" be used to help smaller companies to pay GAW.

The union is believed to be working out details of such a program, and may present its plan to employers once a new contract has been agreed upon at Ford and/or GM.

The GAW pool probably would operate much like the pension pools in operation in Detroit and Toledo. Five years ago, UAW achieved contracts whereby smaller employers grouped together to contribute so many cents-per-hour to a joint fund. Out of this central pool are paid the pensions to workers who have retired from any of the member firms. If such a play were to be used for GAW, a central trust fund to back up the "pay-as-you-go" aspect of the union's GAW demands probably would be established.

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A variety of machining operations, unique in sequence, is combined on a new 15-station automatic transfer machine. Grouping standard machine tool units attains maximum production and utilizes automation. In addition, the M. & M. Triple-Chip circular saw cut-off makes possible the use of low cost stock material; increases your ultimate savings. Start by sending us your part drawings for a production solution by Motch & Merryweather.

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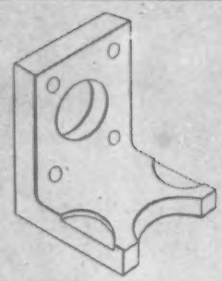
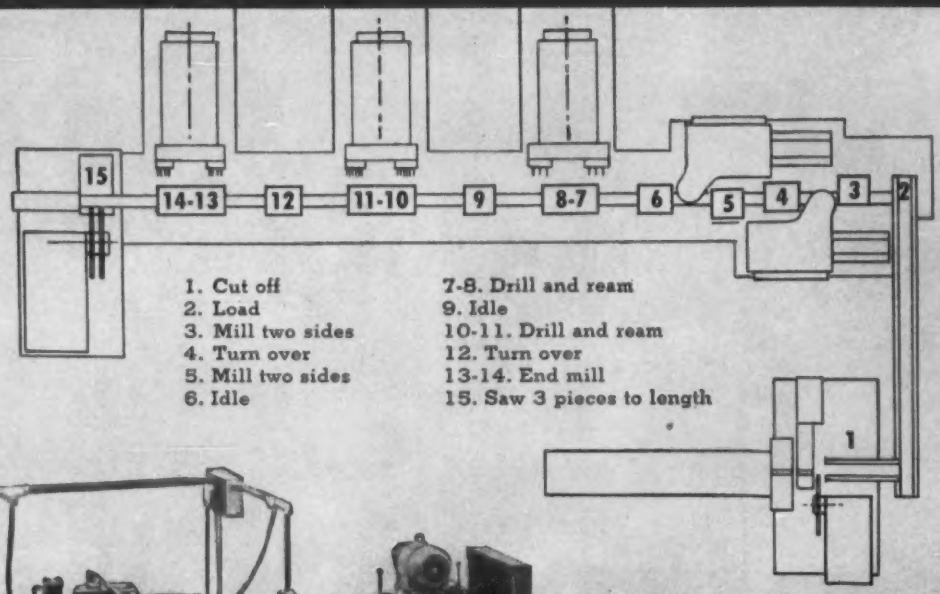


Part Name:
Cylinder bracket.

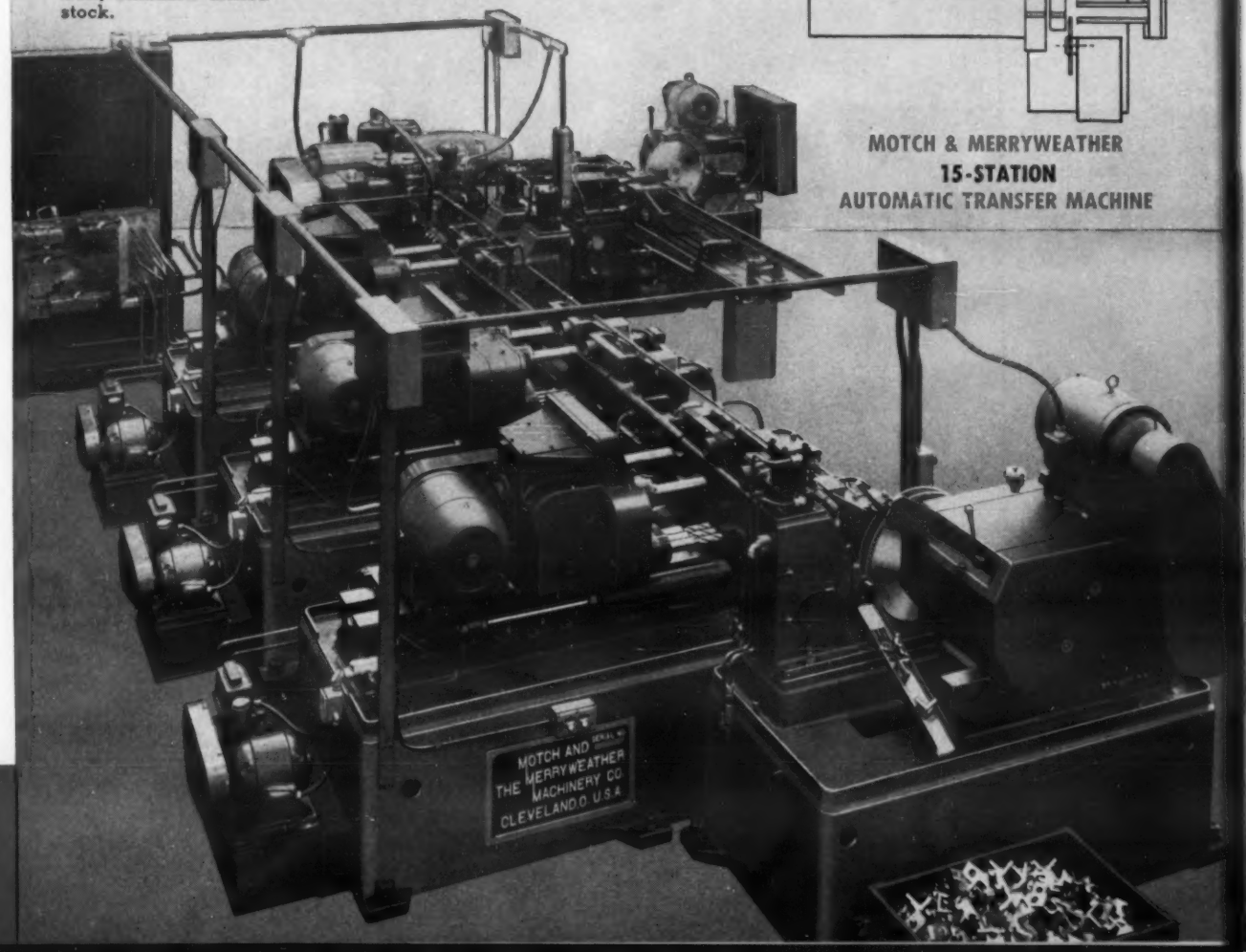
Production:
384 pieces per hour.

Material:
3" x 2½" x ½" angle iron, standard milled stock.



1. Cut off
2. Load
3. Mill two sides
4. Turn over
5. Mill two sides
6. Idle

7-8. Drill and ream
9. Idle
10-11. Drill and ream
12. Turn over
13-14. End mill
15. Saw 3 pieces to length



MOTCH & MERRYWEATHER
15-STATION
AUTOMATIC TRANSFER MACHINE

Machine Tools . . .

Air Force program ready to roll . . .

The $84 million Air Force reserve machine tool program is about to roll. It finally has been cleared at the top, some bids have been asked on machines to be purchased, and negotiations will get under way soon with machine tool builders.

Assurance is given in Washington that a substantial number of orders will be placed before the end of the current fiscal year on June 30.

Best guess is that $10-$15 million will have been allocated to builders by then.

The remainder of the money will be distributed in the form of orders by December 31, according to Air Force predictions.

How to spend the final $5-$10 million promises to be the hardest problem. This is to be expected, Washington officials argue. It is relatively easy to decide where most of the money will go, because a certain number of specified types of machines are "musts." Beyond that point, however, one gets into a realm in which opinions differ.

Pentagon may veto Convair project . . .

Pentagon officials and aviation people are reported to have questioned the advisability of the Air Force's spending $1.1 million to develop a 200-ton electronically-controlled milling machine at Convair to produce plane parts or dies.

Critics are pointing out that machines conforming to standards set up by the Aircraft Industries Association will do essentially the same job as the proposed monster and will cost half as much.

It is a safe prediction that the projected machine will not be built.

AMC tooling for new V-8 engine . . .

Machine tools for the V-8 engine production line to be set up at Kenosha, Wis, by American Motors have already been bought and are scheduled for delivery this summer. The company announced last week that it is spending $60 million for product development and plant expansion and modernization.

American Motors, with limited capital, is keeping costs of tooling to a minimum. It will transfer from the abandoned Hudson plants at Detroit to Kenosha a lot of machine tools formerly used to make the old Hudson engine. Considerable money will go for retooling these machines.

AMC originally hoped to get production going in time to put the new engine in 1956 Hudson and Nashes.

It seems doubtful now whether this will be possible. About 30 engines an hour will come off the new line. Output may eventually be boosted to 60 an hour.

Machine tool orders hold gains . . .

Machine tool orders in March totaled more than $63 million. March was the fourth consecutive month in which bookings by the industry were $60 million or better. There has been a slight but steady gain each month since December, when the index of the National Machine Tool Builders' Association suddenly jumped to 202.9 from 119.5 in November (1945-1947 = 100).

First-quarter orders for machine tools were at an annual rate of $740 million.

Recovery in demand for general-purpose machine tools has been the most encouraging development.

One builder who booked a lot of business prior to a price advance on February 1 sold more machines at the new prices in February and March than he did in the same months a year ago. This upsurge in sales has been widespread in the industry.

Machine tool shipments, reflecting the betterment in sales, shot up in March to 202.4 from 168.2 the previous month.

166 exhibitors will have displays at the Machine Tool Show in Chicago September 6-17. Some 441 types of machine tools, in various sizes and combinations, will be in operation.

MACHINE TOOL INDEX
1945-47 = 100)
(Source, National Machine Tool Builders' Assn.)

SPECTACULAR GAIN IN SHIPMENTS, from 168.2 on the February Index to 202.4, reflects the equally spectacular rise in New Orders last December, now making itself felt in machine tool output. New orders continue a steady rise from the plateau set last December, to 214.3 on the March Index

FIBERGLASS MOLDS . . . Kellering the male half of a mold to be used

PRATT & WHITNEY "KELLERING" . . . .

DOES BIG JOBS BETTER!

BIG AND COMPLICATED . . .

THE PART:
a 20 ft. diameter ring section from a water turbine.

REQUIRED:
accurate machining of 16 blade recesses following the contour of inner wall.

COMPLETED:
simply and economically by lowering the work over a BG-22 Keller Machine. A single 3-dimensional model served for all 16 recesses.

(Photo Courtesy Markham & Company Ltd., Chesterfield, England)

P & W KELLER MACHINES . . .

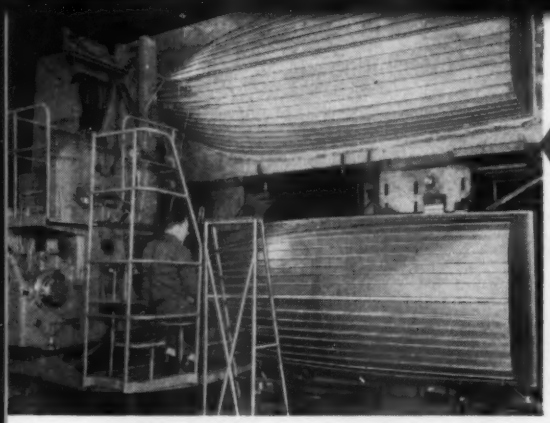
- **MAKE HARD JOBS EASY** . . . handle shapes and curves that cannot be machined economically by any other method.
- **ARE DESIGNED, BUILT *SPECIFICALLY* for TRACER-CONTROLLED MILLING** . . . not just "adapted". They handle a wide variety of jobs without major adaptation by expensive attachments.
- **ARE RUGGED, RIGID, EFFICIENT, DEPENDABLE** . . . stay on the job year after year without frequent or expensive maintenance.
- **FEATURE BUILT-IN ELECTRIC TRACER CONTROL** . . . which provides a quick change from 2-dimensional profiling to 3-dimensional milling . . . duplicates ***exactly*** without need for compensating master.

You can't guess about the right machine . . . or other equipment for ***your*** job requirements. To achieve maximum productive efficiency, every machine tool you buy must be carefully selected and expertly application engineered to meet ***your*** specific needs exactly!

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

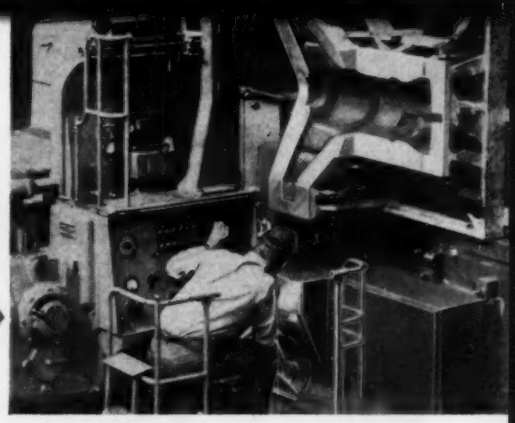
SEE US AT BOOTH 1219

MODERNIZE with PRATT & WHITNEY REPLACE FOR PROFIT

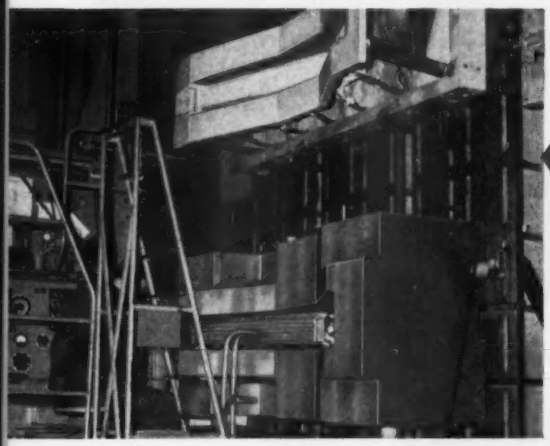


FIBERGLASS MOLDS . . . Kellering the male half of a mold to be used in producing sixteen-foot fiberglass motorboat hulls. Both male and female molds were duplicated from wood models.
(Photo Courtesy
R. H. Freitag Co., Akron, Ohio)

LARGE AIRCRAFT DIE . . . for making aluminum forgings. Three-dimensional milling from a plaster model. Work size capacity of this BG-22 Keller Machine is 10′ x 5′.
(Photo Courtesy
Wyman-Gordon Co., Worcester, Mass.)

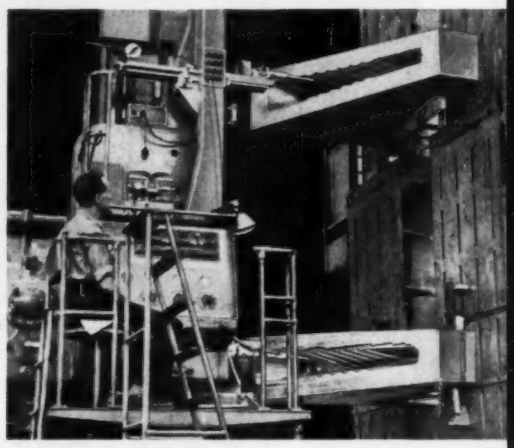


AUTOMATIC TRACER-CONTROLLED MILLING of COMPLEX, IRREGULAR SHAPES

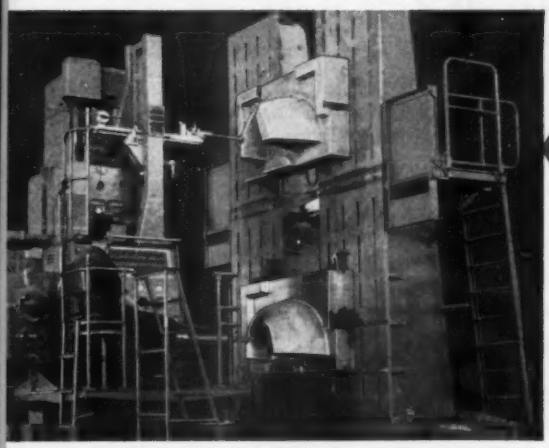


FORGING DIE . . . for big, magnesium aircraft parts is machined on a P&W BG-22 Keller Machine. Exact form of the plastic model is duplicated quickly, economically.
(Photo Courtesy
Wyman-Gordon Co., Worcester, Mass.)

DEEP, NARROW INTERNAL SECTIONS . . . make this aircraft forging die extremely difficult to produce. Keller electric tracer control allows accurate duplication of this deep cavity.
(Photo Courtesy
Canadair Ltd., Montreal, Quebec, Canada)

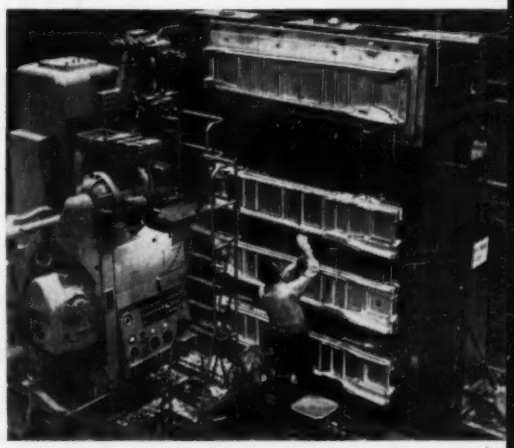


HERE'S THE BG-22 ON THE JOB



BIG PLASTIC MOLD . . . for manufacturing the "radome" in the nose of a military aircraft. Although this machine has capacity of 12′ x 6′, small or large jobs are handled with equal ease.
(Photo Courtesy
Canadair Ltd., Montreal, Quebec, Canada)

PRODUCTION CONTOUR MILLING . . . of large aluminum alloy forgings three at a time on a BG-22 3-Spindle Machine. Parts are main wing beams for jet fighter planes.
(Photo Courtesy
Chance Vought Aircraft, Inc., Dallas, Texas)



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To provide expert application engineering service, all Pratt & Whitney products are made available to you only through our own Factory-Direct Representatives. Each a specialist, these men — working from Branch offices conveniently located throughout the country — are fully qualified by training and experience to help solve your tough production problems . . . to help you select equipment exactly right for your specific needs.

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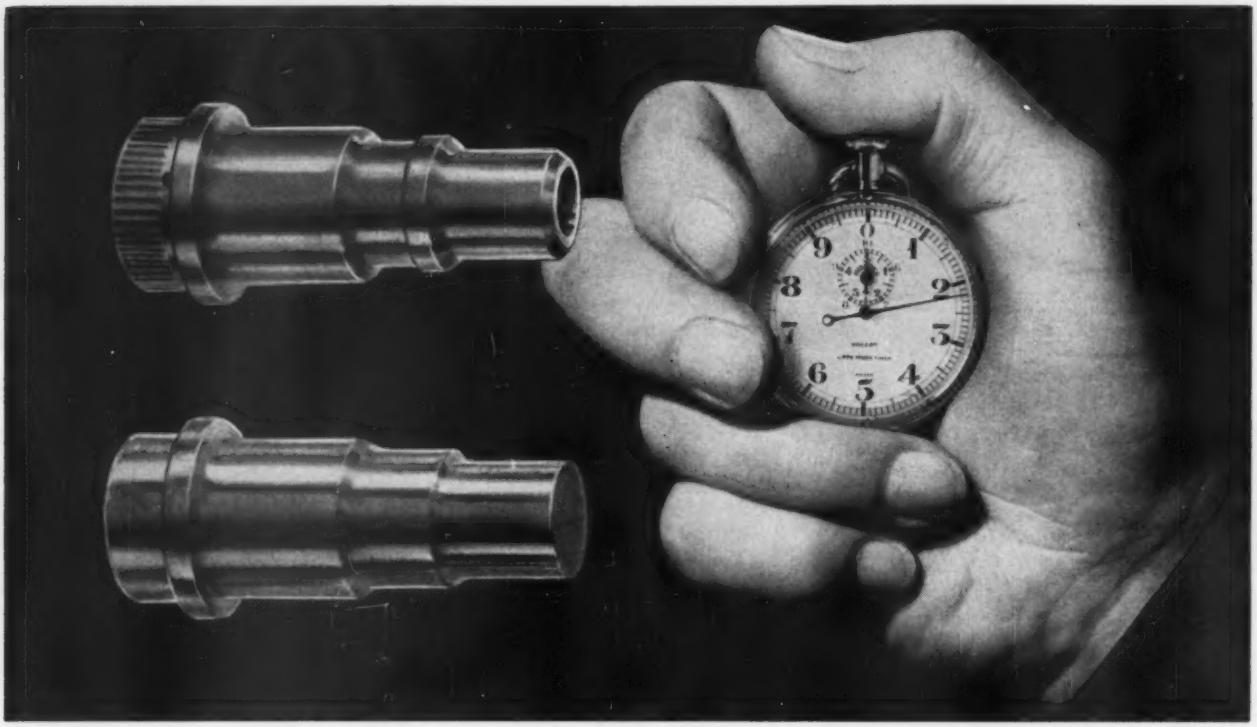
FIRST CHOICE FOR ACCURACY SINCE 1860

MACHINE TOOLS • CUTTING TOOLS • GAGES



Finished 50% faster

Using Ledloy from Ryerson

By the time the B-1113 piece was finished, you'd be halfway through a second Ledloy piece. Such greater speeds and feeds are possible with Ledloy because Ledloy contains a *built-in lubricant* which substantially reduces the friction between the steel and the cutting tool.

That built-in lubricant is *lead*—so finely dispersed through this free-machining, open-hearth steel that you can't see it with a microscope. The addition of this small percentage (.15-.35) of lead has no effect on the mechanical properties of the steel EXCEPT to greatly increase machinability.

Ryerson Ledloy machines up to 50% faster than B-1113 . . . tool life is extended as much as 200% . . . and net savings of 25% and more are effected. And Ledloy machines to an unusually clean, smooth finish—case hardens effectively —and bends, crimps, swedges or rivets easily.

Ask your Ryerson representative for the facts about Ledloy or write us direct for engineering data. Ryerson was the first to stock Ledloy and today your nearby Ryerson plant carries the world's largest stocks of Ledloy rounds, squares and hexagons in a wide range of sizes for immediate shipment when you call.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished

ALLOYS—Hot rolled, cold finished, heat treated

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TUBING—Seamless & welded, mechanical & boiler tubes

STRUCTURALS — Channels, angles, beams, etc.

PLATES—Many types including Inland 4-Way Safety Plate

SHEETS—Hot & cold rolled, many types & coatings

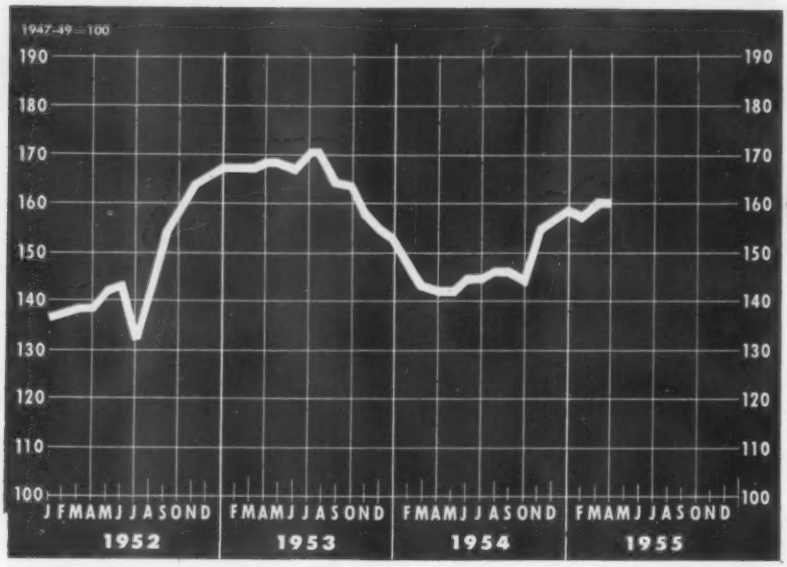
MACHINERY & TOOLS—For metal fabrication

RYERSON CERTIFIED STEELS®

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Gaging Metalworking . . .



160

Production Index

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	APR '55(*)	MAR '55(p)	FEB '54(r)	MAR '54
Total index..	**160**	**159**	**157**	**147**
Machinery	**127**	**125**	**126**	
Electrical Machinery	**186**	**187**	**163**	
Autos	**160**	**152**	**116**	
Other Transportation	**270**	**273**	**267**	
Other Metalworking	**130**	**129**	**123**	

(*) Estimated (p) preliminary (r) revised

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

May to match April record . . .

There is no end in sight to current metalworking boom. In fact, April production is estimated to have risen one point, to 160, on the AMERICAN MACHINIST index. That is only 11 points short of the post-Korean peak in 1953, when defense output was strong.

May seems reasonably sure of matching April's record. The second quarter, as a whole, may well produce a volume just as big as, or perhaps bigger than, the first quarter.

Strong demand is showing up in all segments of Metalworking. It is not confined to consumer goods or to durable goods, but permeates the entire industry.

Consumer goods in heavy demand . . .

The extent of the climb in the first quarter is just coming to light. Take appliances. General Electric reports major appliances up one-third in sales compared with 1954.

Kelvinator states that appliance sales in March were 38% above a year ago, and 50% better in the first 10 days of April. Zenith's sales of TV receivers were the best of any first quarter in history and the "momentum is expected to carry into the second quarter."

Westinghouse has revealed that its consumer products sales "were up considerably" in the first quarter over the similar period a year ago.

International Harvester's employment showed a gain in March for the fifth consecutive month. The improvement was spread throughout all major divisions—farm machinery, motor trucks, industrial products.

Fabulous auto output continues . . .

The fabulous production rate of the automobile industry shows no signs of waning. Its beneficial effects continue to be felt in a vast array of industries supplying materials, parts and components.

Ford's announcement that it will spend $625 million the next three years for expansion of plant and equipment provides a clue to Detroit's thinking.

Machinery orders up 25% . . .

Most of the durable-goods indexes have been climbing for several months — not spectacularly, but enough to give a solid base to the gains.

The McGraw-Hill index of orders for machinery (except electrical) tells graphically how much improvement has taken place. It was at 105 in March, having climbed there from 93 in January.

It was at 83 in March, 1954, and hit a low of 80 in January, 1954. In other words, new business today is 25% better than a year ago.

Steel companies are more optimistic than ever. The second quarter is proving to be as good as the first.

Some mills are scheduling third quarter rollings that give promise of coming up to the current tonnage, unless there should be an unanticipated setback.

Steel warehouse business is very good, with sales running far ahead of last year. Up until recently. warehouses had not felt as strong a demand as mills.

April is believed to have set a new mark in steel production, though final figures are not in.

Demand is good for castings . . .

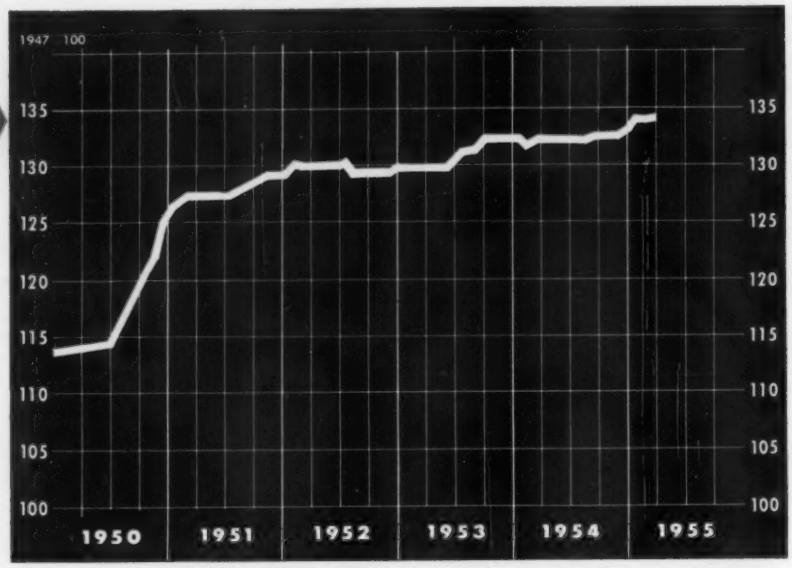
Both malleable and gray iron foundries are running on a normal 60-90 days' backlog of releases against customers' orders. Though automotive business makes up the bread-and-butter volume for both industries, orders from other sources are good, too.

Gaging Business . . .

Price Index

	APR '55(*)	MAR '55(p)	FEB '54(r)	MAR '54
Total Index	**134.5**	**134.3**	**134.2**	**132.8**
Metalworking Machinery		**146.1**	**145.9**	**142.0**
Other Machinery exc. Electrical		**139.0**	**138.8**	**137.6**
Electrical Machinery		**131.9**	**131.9**	**132.0**
Fabricated Metal Products		**130.5**	**130.5**	**129.0**

(*) Estimated (p) preliminary (r) revised



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

The boom is on . . .

Things really look good in business and industry. No longer is there doubt that a boom of impressive magnitude is on.

People have money to spend. And they are spending it freely. Beyond that, industry is producing goods at the best rate in two years. Only in 1953, when the defense program was at its height, was business in peacetime better.

Almost all indicators confirm the fact that manufacturing and trade activities are at record or near-record levels in key industries.

Steel output and automotive assemblies are pushing into new high ground. The volume in petroleum, paper, paperboard and lumber is up to or above the 1953 point. Even coal production has made a notable recovery.

Power consumption is way up . . .

Electric power output has been running far above last year's rate. And heavy construction is up 10%.

Construction spending over-all chalked up a new high mark in March. New contract awards have soared 40% above a year ago.

Washington, after looking over all the statistics on business and industry, is breathing optimism.

It feels that the momentum already generated is sufficient to carry the economy through this year at a rate approximating the present.

For one thing, capital expenditures for new plant and equipment will be the greatest in history.

Many long-term programs revealed . . .

There also will be heavy commitments for long-term expansion programs that involve big outlays over the next few years.

Retail sales went to an all-time peak in the first quarter, just after a new record had been set in the final quarter of 1954.

Business is so good that some federal officials are cautioning people to buy goods now instead of later only if they really need them.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	140.9	140.3	121.6
Steel ingot operation (thousands of tons)	2,316	2,284	1,637
Electric power output (million Kilowatt hours)	9,697	9,602	8,257
Production of automobiles and trucks	228,125	218,078	157,710
Engineering construction awards (*Eng. News-Record*—millions)	$458.5	$382.8	$241.1

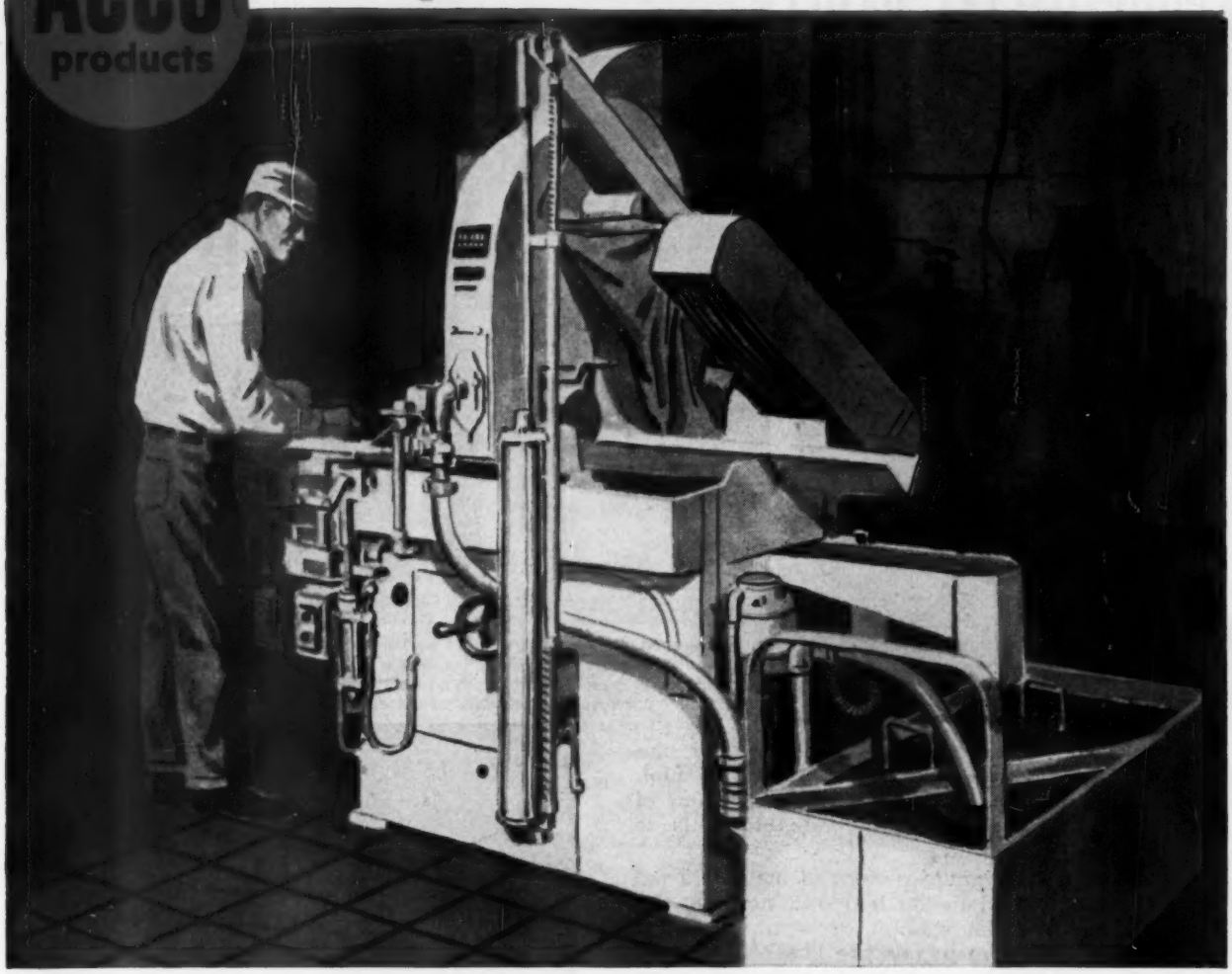
MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949 = 100)*	135	133	123
Index of durable manufactures production (1947-1949 = 100)*	136	134	125
Durable goods manufacturers' sales, millions*	12,442	12,306	11,278
Electrical machinery manufacturers' sales, millions*	1,297	1,335	1,269
Other machinery manufacturers' sales, millions*	1,952	1,900	1,968
Durable goods manufacturers' new orders, millions	12,748	12,118	9,629
Electrical machinery manufacturers' new orders, millions	1,305	1,216	1,264
General machinery manufacturers' new orders, millions	2,010	1,903	1,599

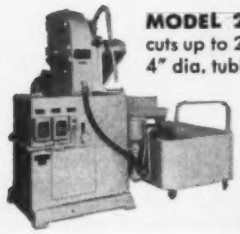
*Seasonally adjusted

ACCO products

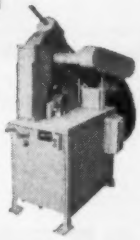
Campbell Abrasive Cutters



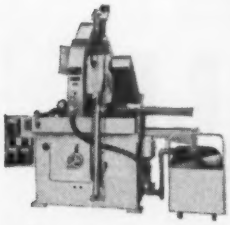
Reduce cutting time on alloy and high carbon steel from minutes to seconds...



MODEL 223
cuts up to 2" dia. solids; 4" dia. tubing



MODEL 28 SEVER-ALL
dry cutter with capacity to 4" x 4" solids



MODEL 406 CUTAMATIC
cuts up to 6" dia. solids

• CAMPBELL Abrasive Cutters reduce your labor costs and the number of machines required. They do it by cutting alloy and high carbon steel in seconds instead of minutes. They give you a clean, smooth cut without work-hardening, and often eliminate finishing operations.

A complete line of CAMPBELL Abrasive Cutters—fully and semi-automatic—are available to fit your specific cutting requirement. CAMPBELL sales engineering experts will help you select the cutter your work demands. They will consult with you on cutting problems.

Why not increase YOUR cutting output per man hour?
Write for Bulletin DH-301 on "The Principles of Abrasive Cutting"

ACCO
TRADE MARK

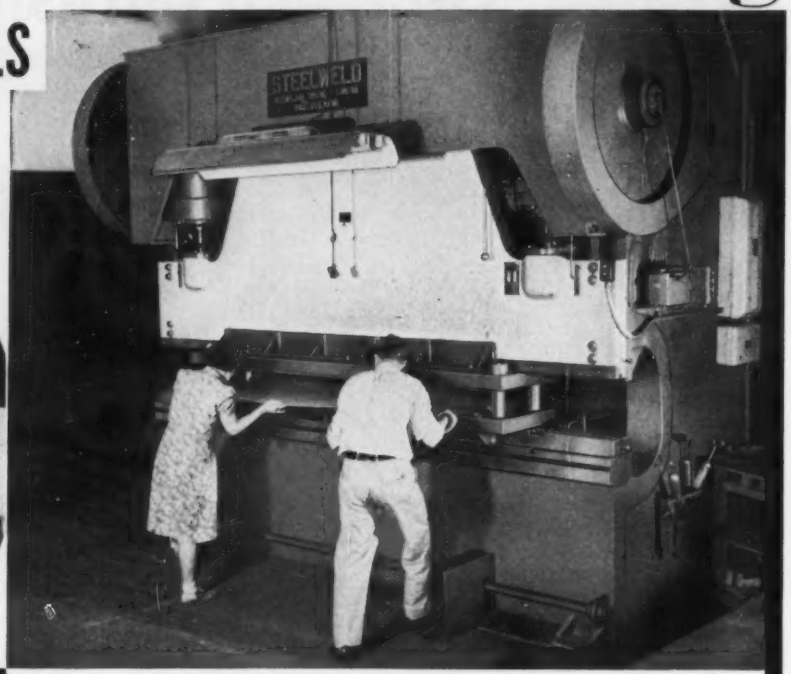
Campbell Machine Division
AMERICAN CHAIN & CABLE
923 Connecticut Avenue, Bridgeport 2, Connecticut

Wet and Dry Cutters and Nibblers

blanking and embossing

ACOUSTIMETAL PANELS

4800 panels for 12" x 24" sound-deadening cells are blanked out and embossed per 8-hour day with these dies.



This rugged smooth-working press performs nearly every kind of metal forming operation at Dussing & Hunt, Inc.—bending, forming, flanging, blanking, embossing, and punching. It is easy to change the dies from one job to another or repeat previous runs of work to close tolerances.

Of the many types of work performed on the Model J4½-10 Steelweld Press at Dussing & Hunt, Inc., Buffalo, N. Y., the blanking and embossing of panels for Acoustimetal sound-deadening cells is one of the most interesting.

Large sheets of 26 gauge perforated metal are fed into the dies attached to the bed and ram, by the man operator and his woman assistant. At each stroke of the ram three panels are blanked out and embossed. Six panels for 12" x 24" cells are made from each sheet. 100 sheets are passed through the press per hour. Thus, 600 panels are turned out per hour, or 4800 per eight-hour day.

A large variety of metal parts are produced on the Steelweld. Included are 22-gauge stainless steel tops for deep-freeze cabinets with neatly rounded flanges, fire-proof doors and all-steel industrial doors of 10 to 14 gauge, 14-gauge pressed steel frames, heavy steel channels and many other parts.

The press was installed in 1942 and has been kept going continuously. The Plant Manager of this rapid-growing concern says, "It has proved very satisfactory and efficient."

Acoustimetal panels are produced with such speed that one man is kept busy at the rear of the press removing the scrap and a woman is fully occupied stacking the panels as they roll down the conveyor from the press bed.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

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STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Taking the Work Out of the Work

Have you ever driven on a road in Britain among the swarming bicyclists? If you have, you must have marveled at the intrepid Englishmen who ride through rain or shine and who have bulging leg muscles and a ruddy look as a result.

Our athletic coaches complain, by contrast, about the puny leg muscles of young Americans who ride everywhere in cars instead of walking or cycling. They prescribe for youngsters in training special leg exercises to build up muscles grown flabby from non-use.

Let's not fool ourselves into believing, however, that physically-lazy Americans are going to change their comfortable habits because of what the coaches say. It is the age of the automobile; and every American intends to enjoy it.

It is not much different in the factory than at home. **Management is making it physically easier for the worker year by year. He no longer has to pull, tug, lift and carry materials as he used to. Mechanical devices now do it for him.**

In fact, the process of "breaking your back" on a job is rapidly being looked upon as antediluvian. Even in very small shops, work now is handled more and more with mechanical aids, saving the wear and tear on the worker.

The new habits have taken hold. It is the age of horsepower in the factory as well as on the highway. Human muscles are being pampered; and the worker loves it. He would not go back to the old days for anything.

Management no longer has a choice. If it wants to keep its good workers, it must provide them with the materials-handling equipment that eases the job physically. Otherwise, the men are lured to other places to work where such aids are at hand.

There are even more potent reasons, for equipping your shop with efficient mechanical-handling devices, than merely maintaining your workers in the comfort to which they have become accustomed. Cost-saving is one of them. And it is about the most powerful reason of all.

This is the day of the one-floor-type factory laid out for maximum efficiency in the flow of parts, materials, and assembly. **The multi-story plant is at a grave disadvantage. It can survive costwise only if every possible use is made of carrying work swiftly and economically by conveyor or truck or crane from one point to another, and from one floor to another.** If that is not done, costs are bound to be very high at a time when prices are hotly competitive.

Just because you have a one-floor-type shop does not in itself mean that you have solved your work-handling problems. They deserve close and constant study, not merely a one-shot treatment.

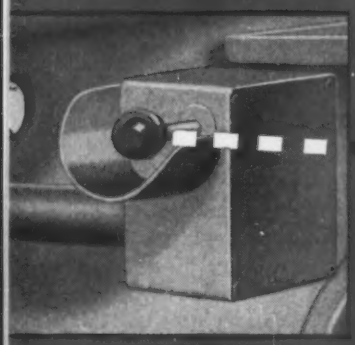
Opportunities for cutting costs by better handling of materials are prodigious. Often the indirect benefits outweigh the direct. As an example:

One midwest manufacturer found it impossible to use the full capacity of his up-to-date machine tools because loading and unloading them took so long. He was losing much of the extra production and cost-saving that he had expected when he installed the new machines. He got out of his difficulty by equipping the machines with automatic feeding and ejecting units.

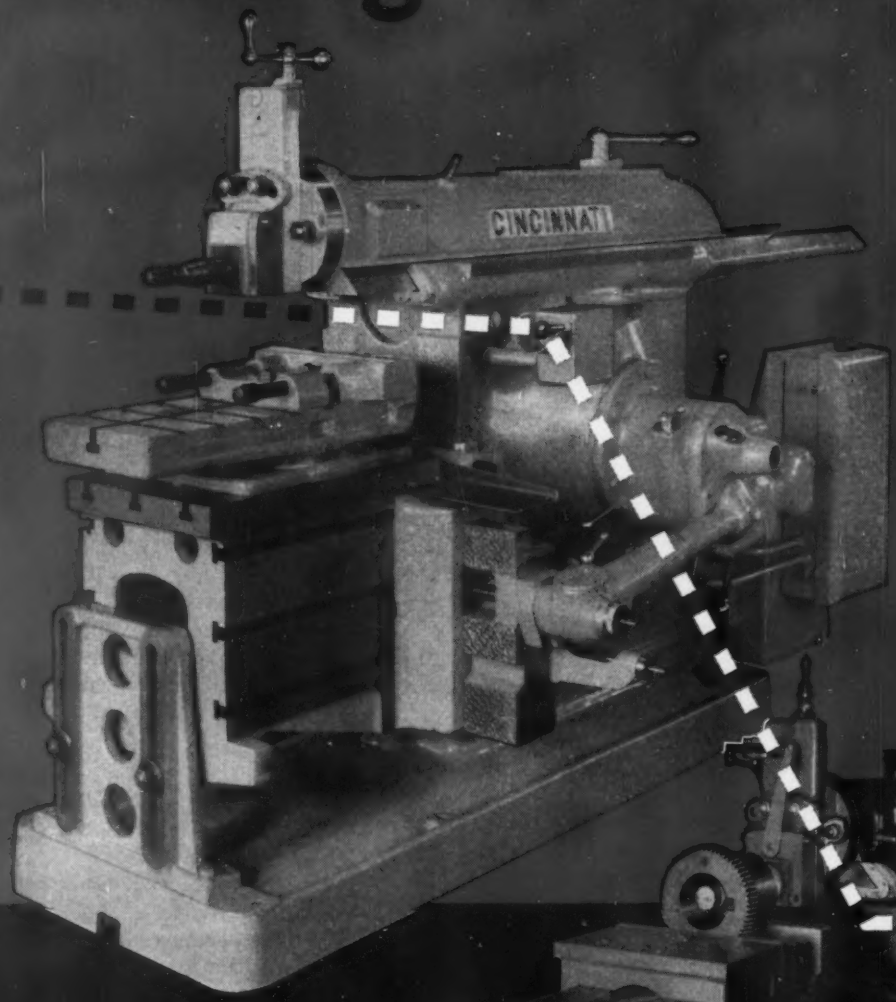
Mechanical handling in the shop deserves top management attention. Properly applied, it can do wonders in speeding output, in lowering costs, in getting the most out of machines, and in taking the labor out of the work that your men do. Scarcely anywhere else in the plant are there bigger dividends to be had.

Burnham Finney

Outstanding Time Saver...
...Outstanding ACCURACY



Single Control Lever



The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, gives the operator the fastest, simplest and most accurate control of his Shaper and converts waste time into productive time.

This powerful clutch and brake requires no adjustment, and has a long, maintenance-free life.

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American Machinist

How to select wheels for grinding tool steel

With a classification of SAE tool steels by their grinding characteristics—their grindability—a simple basis is established for selecting the right grinding wheel

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In today's highly competitive market, production men are turning to more abrasion-resistant steels for cutting tools and dies. This has led to development of many new alloy steels, with the result that both grinding-wheel and tool-steel manufacturers have been beseiged with requests for assistance in grinding them.

To furnish this important information, Norton found it necessary to conduct a series of surface-grinding tests on all the principal types of tool and die steels currently available. The results of this project, planned and supervised by Dr Leo P Tarasov, were published in a paper entitled, "Grindability of Tool Steels," (Transactions, ASM, Vol. 43, 1951, 1144-1174).

Briefly stated, it was found that the relative ease of grinding hardened steel pieces of the same size and shape with a given wheel could be expressed numerically as the ratio of volume of metal removed to volume of wheel wear. For convenience, this ratio was called the *grindability index* for the particular set of grinding conditions.*

Just as machinability refers to the relative ease of machining metals, so grindability refers to the relative ease of *grinding* them. It should be emphasized that grindability is concerned only with the ease of *removing* metal; it does not relate to the ease of obtaining a good finish nor to the resistance of the steel to cracking during or after grinding.

Metallographic and microhardness studies have clearly shown that the grindability of hardened tool steels depends chiefly on the hardness and the amount of the carbide particles always present in these steels. The hardness of the carbides, in turn, depends upon their chemical composition. They are, in the order of rapidly increasing hardness: the iron carbides present in plain carbon steels, the complex iron-chromium carbides present in high-carbon, high-chromium die steels, and the vanadium carbides present in high-vanadium, high-speed steels.

CLASSIFICATION

Tool steels are classified in various ways, depending upon their composition, heat-treatment, or use. There are numerous varieties within each general type, and they have usually been listed by their brand names. Various detailed classifications not involving trade names have been proposed, but only the recently developed AISI-SAE system has received general acceptance. This classification of tool steel compositions is described in "How to Work Steel" (*AM*—Mid-Nov, '54, p134). A list of the classification numbers and approximate composition will be found in Table 105 in that report.

Because tool steels are best known by their brand names, the reader who wishes to know the classification into which a particular brand of tool steel falls can get this information either from the vendor or from the "Directory of Tool and Die Steels," (*AM*—Mid-Nov, '54, p146). The AISI-SAE designations are referred to as the key to selecting the proper wheel specifications, wherever possible in the following discussion, in preference to the manufacturer's brand name.

GRINDABILITY VALUES

Table I gives an idea of the relative grindability of a known tool or die steel. The grindability index can be found if the general type to which the steel belongs (such as high-speed steel); or its AISI-SAE designation, or its brand name, or the brand name of some other manufacturer's equivalent steel is known. Because of space limitations, only a few representative brand names of the many available are listed here.

The chief value of Table I lies in its evaluation of the grindability relationship of one steel to another. For example, a well known New England manufacturer of slitter saws recently contemplated producing a line of highly wear-resistant saws made of a T15 steel (relative grindability index of 0.8). His experience had been chiefly with T1 steels (relative grindability index of 6-12), and more recently with M2 steel (relative grindability index of 4). Not being familiar with the grindability index of the various steels, the manufacturer, although expecting greater wheel wear when grinding T15 steel than with M2, did not

Test Conditions: Machine: Norton 6x18-in. surface grinder, horizontal spindle, reciprocating table. Crossfeed: 0.050 in. per table traverse. Wheel size: 8x½x1¼ in. Wheel specifications: 32A46-I8VBE. Wheel speed (idling): 6,000 sfpm. Downfeed: 0.001 in. per crossfeed. Table speed: 720 in. per minute. Coolant: water-soluble oil, 1:40 mixture.

table I. . EXPERIMENTAL GRINDABILITY VALUES

Description of Steel	AISI—SAE Designation	Hardness Rockwell C	Grindability Index	Grindability Group	Representative Brand Names		
MISCELLANEOUS TOOL STEELS							
Plain Carbon	W1	63	Over 40	1	No. 11 Special	Sanderson Special	XXX
Non-Deforming Oil-Hardening Low Alloy	O2	58	Over 40	1	Stentor	Deward	Paragon
Nickel-Chromium	L6	61	Over 40	1	R.D.S.	Champaloy	Nikro M
Non-Deforming Air-Hardening Low Alloy	A4	59	Over 40	1	Airmo		
(Die Steel)	A5	59	Over 40	1		Airloy	
Shock Resisting	A6	59	Over 40	1			Vega
Hot Work	S2	60	Over 40	1	Solar	Triton	Venango
Non-Deforming Air-Hardening Medium Alloy	H11	50	Over 40	1	No. 883	Firedie	Hotform No. 2
Hot Work	A2	60	20	1	No. 484	Sparta	Air Hard
Finishing	H21	53	20	1	T-K	Atlas A	Calo-Ferro 30
	F2	61	5	2 or 4	K-W	Colonial No. 4	Crucible Double Special
TUNGSTEN-BASE HIGH-SPEED STEELS							
W — Cr — V							
18 4 1	T1	64	6 to 12	2 or 4	Rex AA	Clarite	Red Cut Superior
18 4 2	T2	63	4	2 or 4	Rex Supervan	Electrite No. 19	Vulcan Superior
18 4 2, 12 Co	T6	63	3	3 or 4	Gray Cut Cobalt	Bonded Carbide	Rex 440
18 4 3	T3	62	1.1	3 or 4	Electrite Vanadium	Red Tiger	Rex 939
18 4 4	T9	64	0.4	5	Rex 4V		
14 4 2	T7	63	6	2 or 4	Rex Champion	Extra Special HS	Star Blue Chip
14 4 3		63	0.6	5	Rex 3V		
13 5 5, 5 Co	T15	67	0.8	5	Vasco Supreme	Panther 5	Red Sabre
MOLYBDENUM-BASE HIGH-SPEED STEELS							
W — Mo — Cr — V							
2 8 4 1	M1	64	7	2 or 4	Motung	Mo Cut	Star Max
0 8 4 2	M10	64	3½	2 or 4	Rex VM	Electrite TNW	Movan
6 5 4 1, 1Cb	M8	64	7	2 or 4	Star Columbium		
6 5 4 2	M2	64	4	2 or 4	Motung 652	Vasco M-2	Mustang
6 6 4 2½		65	1.0	3 or 4	Unicut		
6 6 4 3	M3	64	1.0	3 or 4	Electrite HV-6		
6 5 5 4	M4	65	0.7	5	Neatro		
6 4 4 5, 5Co		65	0.8	5	Super Unicut		
6 3 5 5, 5Co		66	0.6	5	Vasco Supreme A		
DIE STEELS							
High-Carbon, High-Chromium Oil-Hardening	D3	62-64	3½	2 or 4	Hampden	Huron	HYCC
Air-Hardening	D5	59	3½	2 or 4	No. 610	Cromovan	Atmodie
High-Vanadium Air-Hardening		65	1.2	2 or 4	BR-4		
High-Carbon, High-Vanadium C — Mo — Cr — V							
3 1 1 12		61	0.4	5	Ottawa 60		
Graphitic Tool Steels Oil-Hardening	O6	63	Over 40	1	Graph-Mo		
Water-Hardening (Shallow)		65	Over 40	1	Graph-Al		
Air-Hardening		63	Over 40	1	Graph-MNS		
Water-Hardening (Medium)		63	8	2 or 4	Graph-Tung		

know what would be considered normal wheel wear for the T15. A comparison of wheel wear showed that the T15 steel produced a little more than five times as much as the M2 for the same stock removal.

As already stated, M2 steel has a grindability index of 4; T15 steel, of 0.8. The grindability index G, we have said, is the ratio of cubic inches of material removed M per cubic inch of wheel wear W. If the manufacturer had had the benefit of the information provided by Table I, roughly five times the wheel wear would have been anticipated, and accepted as quite normal for the more abrasion-resistant T15 steel.

The grindability index was determined only for a single wheel

specification and a single operation, and will vary for different wheels and operations. As a result of subsequent tests conducted in the customer's plant, the wheel ultimately adopted for the T15 steel wore only three times faster than the wheel found best for the M2 steel.

GRINDABILITY GROUPS

A study of hundreds of grinding-wheel specifications successfully used in grinding tool and die steels showed that relative grindability ratings obtained in the field paralleled fairly closely those previously determined in the laboratory. For all practical purposes, it was found that these steels could be divided into five grinding-recommendation groups as listed in Table II. All tool steels are listed here by their AISI-SAE designations with the exception of a few that do not fit into this scheme, hence are listed by their brand name.

The five grinding-recommendation groups take into account not only the steel's relative grindability, but also the *area of the work surface* to be ground. Experience has shown that in the lower grindability range (Groups 2 and 3), the work area affects the grinding-wheel specification. For this reason, where the work surface is relatively large, as in dies, Group 4 includes all Group 2 and 3 steels.

Steels in the very low grindability range, Group 5, are affected in a like manner, but not enough experience has been acquired yet to permit a breakdown according to work area.

It should be noted that Group 1 also includes all the constructional steels, as these have the same grinding, characteristics in the hardened state as plain-carbon or oil-hardening tool steels. The constructional steels, as distinguished from the tool steels, include plain-carbon steels, such as SAE 1045; alloy steels, such as SAE 4340 or 52100; and, of course, the carburized steels. Although we here are primarily concerned with tool and die steels, the information can be applied just as well to any of the constructional steels, if they are covered by the grinding operations listed.

WHEEL SELECTION

Once it has been decided into which of the five groups in Table II a given tool steel falls, reference to that group in Table III will show the recommended wheel specifications for a wide variety of operations.

It is not practical to give a more complete breakdown of Table III, because final wheel selection for a particular job can be affected by many factors. Those which influence grinding-wheel selection are: diameter of work, width of wheel used, wheel and work speeds, type of steel and its hardness or heat-treatment history, grinding fluid and its concentration, rate of production, condition of grinding machine, and experience of the operator. An experienced operator is one capable of adapting his skills and knowledge to making any one of a number of grinding-wheel specifications do the job required.

Specifications in Table III are selected throughout to provide a good finish in accordance with the general requirements for tools and dies. Coarser grit specifications are advisable for roughing, if this operation is to be done prior to finish grinding, or if final finish is not critical.

In using Table III, the first choice shown is the suggested starting specification. If results obtained are not wholly satisfactory, this first-choice specification should be modified to fit the material or job more closely. For example, if the original specification (assuming it was 38A60-I8VG) was inclined to burn the work or was not sufficiently cool cutting, it would be logical to try a wheel one grade softer, namely, 38A60-H8VG.*

If sufficient experimenting with the first-choice specification shows it to be unsuitable, then, the second or even third choice, in some cases, should be tried, following the same line of reasoning. Generally, the second choice will be satisfactory, although resultant grinding cost

**These tests are based on work with Norton wheels, and the author has used this brand specification throughout. These can be translated into similar specifications for other brands when desired.—Editor.*

table II. . GRINDABILITY CLASSIFICATION OF TOOL STEELS

GROUP 1—High-grindability tool and die steels
(grindability index greater than 12)
Any area of work
W1, W2, W3, W4, W5, W6, W7
S1, S2, S3, S4, S5
O1, O2, O6, O7
A2, A4, A5, A6
H11, H12, H13, H14, H15, H16, H20, H21, H22, H23, H24, H25, H26
L1, L2, L3, L4, L5, L6, L7
Unclassified: Graph-Al Graph-MNS

GROUP 2—Medium-grindability
(grindability index over 3 to 12)
Small area of work (as found in tools)
H41, H42, H43
T1, T2, T4, T7, T8
M1, M2, M8, M10, M30
F1, F2, F3
D1, D2, D3, D4, D5, D6
Unclassified: Graph-Tung

GROUP 3—Low grindability
(grindability index between 1.0 and 3)
Small area of work (as found in tools)
T3, T5, T6
M3, M6, M34, M35, M36
Unclassified: BR-4

GROUP 4—Medium and low grindability
(grindability index between 1.0 and 12)
Large area of work (as found in dies)
This group includes all steels found under Groups 2 and 3

GROUP 5—Very low grindability tool and die steels
(grindability index less than 1.0)
Any area of work
T9, T15
M4
Unclassified: Rex 3V, Super Unicut, Vasco Supreme A, Ottawa 60

How to select wheels for grinding tool steel . . . continued

may be higher than if the first choice had worked. If the first choice is not satisfactory, the second choice may very well be the "ace up your sleeve."

HOW TO USE THE TABLES

Assume that you have purchased a new high-carbon, high-chromium oil-hardening die steel and its AISI-SAE designation is D3; that you have done the machining and heat-treating and the die which you are making has a relatively broad surface to be ground flat. The surface grinder you have chosen for the job mounts a wheel 20 in. in dia x 3 in. wide and you intend to grind to a fine finish, having left as little stock as possible before heat-treating. The grinder is equipped for wet grinding. As D3 steel is quite heat sensitive, wet grinding (with a water-soluble coolant) is necessary in order to minimize the danger of burning or cracking.

The next step is to select the proper grinding wheel for this operation. First, in Table II, you find D3 steel is listed under Group 2, but knowing that you intend to grind a relatively large area, you move down the chart to Group 4, which includes all steels listed under Groups 2 and 3 but presenting *large areas* of work, as in the case of dies.

Now, consulting Table III, Group 4 steels, you follow down the column headed "Operation" until you come to "Surfacing—straight wheels." Knowing that the wheel for your machine is 20-in. in dia, you follow across to the right under the column headed "Wheel Diameter." A 20-in.-dia wheel falls into the "over 14-in. diameter" group, so you continue to the right on this line and arrive at the first-choice specification, 32A46-H8VG. This, then, is the wheel recommended for surface grinding your D3 dies.

Perhaps you feel that the amount of stock to be removed calls for an initial rough-grinding operation with a coarser-grit, faster-cutting wheel, such as 36 grit. In this case, because it is a Group 4 steel, simply back off one grit size so the recommended specification for roughing is 32A36-H8VG.

table III. . *GRINDING-WHEEL RECOMMENDATIONS FOR*

OPERATION	WHEEL SIZE	FIRST CHOICE SPECIFICATION	SECOND CHOICE SPECIFICATION
GROUP 1 STEELS			
Surfacing—			
Straight wheels	14" dia. & smaller	Wet 32A46-I8VG	
	14" dia. & smaller	Dry 32A46-H8VG	32A46-F12VBEP
	Over 14" dia.	Wet 32A36-I8VG	
Segments	1¼" rim or less	Wet 32A30-H8VG	32A36-F12VBEP
Cylinders	1¼" rim or less	Wet 32A30-H8VG	32A36-E12VBEP
Cups	¾" rim or less	Wet 32A36-H8VG	32A46-F12VBEP
	(for wider rims, go one grade softer in available specifications)		
Cutter sharpening—			
Straight wheel		Wet 32A46-K8VG	32A60-K8VG
		Dry 32A46-J8VG	32A46-H12VBEP
Dish shape		Dry 38A60-J8VG	38A60-H12VBEP
Cup shape		Dry 32A46-K8VG	38A60-H12VBEP
		Wet 19A46-L5VG	19A60-L5VG
Form tool grinding	8" dia. & smaller	Wet 32A60-L7VG to	32A100-M8VG
	8" dia. & smaller	Dry 32A60-K8VG to	32A100-L8VG
	10" dia. & larger	Wet 32A60-L7VG to	32A80-M7VG
Cylindrical	14" dia. & less	Wet 19A80-L6VG	
	16" dia. & larger	Wet 19A60-K5VG	
Centerless		Wet 19A80-M6VG	
Internal—			
Production grinding	Under ½" dia.	Wet 19A80-N6VG	
	½" dia. to 1" dia.	Wet 19A60-M5VG	
	Over 1" dia. to 3" dia.	Wet 19A54-L5VG	
	Over 3" dia.	Wet 19A46-K5VG	
Tool room grinding	Under ½" dia.	Dry 32A80-L7VG	
	½" dia. to 1" dia.	Dry 32A70-K8VG	
	Over 1" dia. to 3" dia.	Dry 32A60-J8VG	32A60-H12VBEP
	Over 3" dia.	Dry 32A46-J8VG	32A54-H12VBEP
GROUP 2 STEELS			
Surfacing—			
Straight wheels	14" dia. & smaller	Wet 32A46-I8VG	32A46-G12VBEP
	14" dia. & smaller	Dry 32A46-H8VG	32A46-F12VBEP
	Over 14" dia.	Wet 32A46-H8VG	
Segments	1¼" rim or less	Wet 32A30-G8VG	32A36-E12VBEP
Cylinders	1¼" rim or less	Wet 32A30-G8VG	32A36-E12VBEP
Cups	¾" rim or less	Wet 38A36-H8VG	38A46-F12VBEP
	(for wider rims, go one grade softer in available specifications)		
Cutter sharpening—			
Straight wheel		Wet 38A46-K8VG	38A60-K8VG
		Dry 38A46-J8VG	38A60-H12VBEP
Dish shape		Dry 38A60-I8VG	38A60-G12VBEP
Cup shape		Dry 38A46-J8VG	38A60-G12VBEP
		Wet 32A46-K8VG	32A60-J8VG
Form tool grinding	8" dia. & smaller	Wet 38A60-K8VG to	38A120-L9VG
	8" dia. & smaller	Dry 38A80-K8VG to	38A150-K9VG
	10" dia. & larger	Wet 32A60-K8VG to	32A120-L9VG
Cylindrical	14" dia. & less	Wet 38A80-L7VG	
	16" dia. & larger	Wet 32A60-K8VG	
Centerless		Wet 32A80-M7VG	
Internal—			
Production grinding	Under ½" dia.	Wet 32A80-L7VG	
	½" dia. to 1" dia.	Wet 32A70-K8VG	
	Over 1" dia. to 3" dia.	Wet 32A60-J8VG	
	Over 3" dia.	Wet 32A54-J8VG	
Tool room grinding	Under ½" dia.	Dry 32A80-K8VG	
	½" dia. to 1" dia.	Dry 32A70-J8VG	
	Over 1" dia. to 3" dia.	Dry 32A60-I8VG	32A60-G12VBEP
	Over 3" dia.	Dry 32A54-I8VG	32A54-G12VBEP
GROUP 3 STEELS			
Surfacing—			
Straight wheels	14" dia. & smaller	Wet 38A60-I8VG	38A60-G12VBEP
	14" dia. & smaller	Dry 38A60-H8VG	38A60-F12VBEP
	Over 14" dia.	Wet 32A60-H8VG	
Segments	1¼" rim or less	Wet 32A46-G8VG	32A46-E12VBEP
Cylinders	1¼" rim or less	Wet 32A46-G8VG	32A46-E12VBEP
Cups	¾" rim or less	Wet 32A46-G8VG	32A46-E12VBEP
	(for wider rims, go one grade softer in available specifications)		
Cutter sharpening—			
Straight wheel		Wet 38A46-J8VG	38A60-J8VG
		Dry 38A46-I8VG	38A60-G12VBEP
Dish shape		Dry 38A60-H8VG	38A60-F12VBEP
Cup shape		Dry 38A46-I8VG	38A60-F12VBEP
		Wet 38A46-J8VG	38A60-J8VG

HARDENED TOOL STEELS

OPERATION	WHEEL SIZE	FIRST CHOICE SPECIFICATION	SECOND CHOICE SPECIFICATION
Form tool grinding	8" dia. & smaller	Wet 38A80-K8VG to 38A150-L9VG	
	8" dia. & smaller	Dry 38A100-J8VG to 38A150-K9VG	
	10" dia. & larger	Wet 32A80-J8VG to 32A150-K9VG	
Cylindrical	14" dia. & less	Wet 38A80-L7VG	
	16" dia. & larger	Wet 32A60-K8VG	
Centerless		Wet 32A80-L7VG	
Internal—			
Production grinding	Under ½" dia.	Wet 32A90-L7VG	
	½" dia. to 1" dia.	Wet 32A80-K8VG	
	Over 1" dia. to 3" dia.	Wet 32A70-J8VG	
	Over 3" dia.	Wet 32A60-I8VG	
Tool room grinding	Under ½" dia.	Dry 32A90-K8VG	
	½" dia. to 1" dia.	Dry 32A80-J8VG	
	Over 1" dia. to 3" dia.	Dry 32A70-I8VG	32A70-G12VBEP
	Over 3" dia.	Dry 32A60-I8VG	32A60-G12VBEP

GROUP 4 STEELS

Surfacing—			
Straight wheels	14" dia. & smaller	Wet 38A60-I8VG	37C60-I8V
	14" dia. & smaller	Dry 38A60-H8VG	37C60-H8V
	Over 14" dia.	Wet 32A46-H8VG	37C46-G8V
Segments	1½" rim or less	Wet 38A46-G8VG	37C46-G8V
Cylinders	1½" rim or less	Wet 38A60-H8VG	37C60-G8V
Cups	¾" rim or less	Wet 38A60-H8VG	37C60-H8V
	(for wider rims, go one grade softer in available specifications)		
Form tool grinding	8" dia. & smaller	Wet 38A60-J8VG to 38A150-K9VG	
	8" dia. & smaller	Dry 38A80-I8VG to 38A180-J9VG	
	10" dia. & larger	Wet 32A60-J8VG to 32A150-K9VG	
Cylindrical	14" dia. & less	Wet 38A80-K8VG	37C60-J8V
	16" dia. & larger	Wet 32A60-J8VG	37C60-J8V
Internal—			
Production grinding	Under ½" dia.	Wet 38A90-L7VG	37C90-L5V
	½" dia. to 1" dia.	Wet 38A80-K8VG	37C80-K5V
	Over 1" dia. to 3" dia.	Wet 38A70-J8VG	37C70-J5V
	Over 3" dia.	Wet 38A60-I8VG	37C60-I5V
Tool room grinding	Under ½" dia.	Dry 38A90-K8VG	37C90-K5V
	¼" dia. to 1" dia.	Dry 38A80-J8VG	37C80-J5V
	Over 1" dia. to 3" dia.	Dry 38A70-I8VG	37C70-15V
	Over 3" dia.	Dry 38A60-H8VG	37C60-H5V

GROUP 5 STEELS

OPERATION	WHEEL SIZE	FIRST CHOICE SPECIFICATION	SECOND CHOICE SPECIFICATION	THIRD CHOICE SPECIFICATION
Surfacing—				
Straight wheels	14" dia. & smaller	Wet 38A60-H8VG	37C60-H8V	38A60-E12VBEP
	14" dia. & smaller	Dry 38A80-H8VG	37C80-G8V	38A80-E12VBEP
	Over 14" dia.	Wet 32A60-H8VG	37C60-G8V	32A60-E12VBEP
Segments	1½" rim or less	Wet 38A46-G8VG	37C46-F9V	38A46-E12VBEP
Cylinders	1½" rim or less	Wet 32A46-G8VG	37C46-F9V	32A46-E12VBEP
Cups	¾" rim or less	Wet 38A60-G8VG	37C60-F9V	38A60-E12VBEP
	(for wider rims, go one grade softer in available specifications)			
Cutter sharpening—		Wet 38A60-I8VG	38A60-G12VBEP	
Straight wheel		Dry 38A60-H8VG	38A80-F12VBEP	
Dish shape		Dry 38A80-H8VG	38A80-F12VBEP	
Cup shape		Dry 38A60-I8VG	38A80-G12VBEP	
		Wet 38A60-J8VG	38A60-H12VBEP	
Form tool grinding	8" dia. & smaller	Wet 38A80-J8VG to 38A180-J9VG		
	8" dia. & smaller	Dry 38A100-I8VG to 38A220-J9VG		
	10" dia. & larger	Wet 32A80-J8VG to 32A180-J9VG		
Cylindrical	14" dia. & less	Wet 38A90-J8VG	37C80-J8V	38A90-H12VBEP
	16" dia. & larger	Wet 32A80-I8VG	37C80-J8V	38A80-G12VBEP
Centerless		Wet 32A80-J8VG	37C80-K8V	
Internal—				
Production grinding	Under ½" dia.	Wet 38A100-L8VG	37C90-L8V	
	½" dia. to 1" dia.	Wet 38A90-K8VG	37C80-K8V	
	Over 1" dia. to 3" dia.	Wet 38A80-J8VG	37C70-J8V	38A80-H12VBEP
	Over 3" dia.	Wet 38A70-I8VG	37C60-I8V	38A70-G12VBEP
Tool room grinding	Under ½" dia.	Dry 38A100-K8VG	37C90-K5V	
	½" dia. to 1" dia.	Dry 38A90-J8VG	37C80-J5V	
	Over 1" dia. to 3" dia.	Dry 38A80-I8VG	37C70-I5V	38A80-G12VBEP
	Over 3" dia.	Dry 38A70-I8VG	37C60-I5V	38A70-G12VBEP

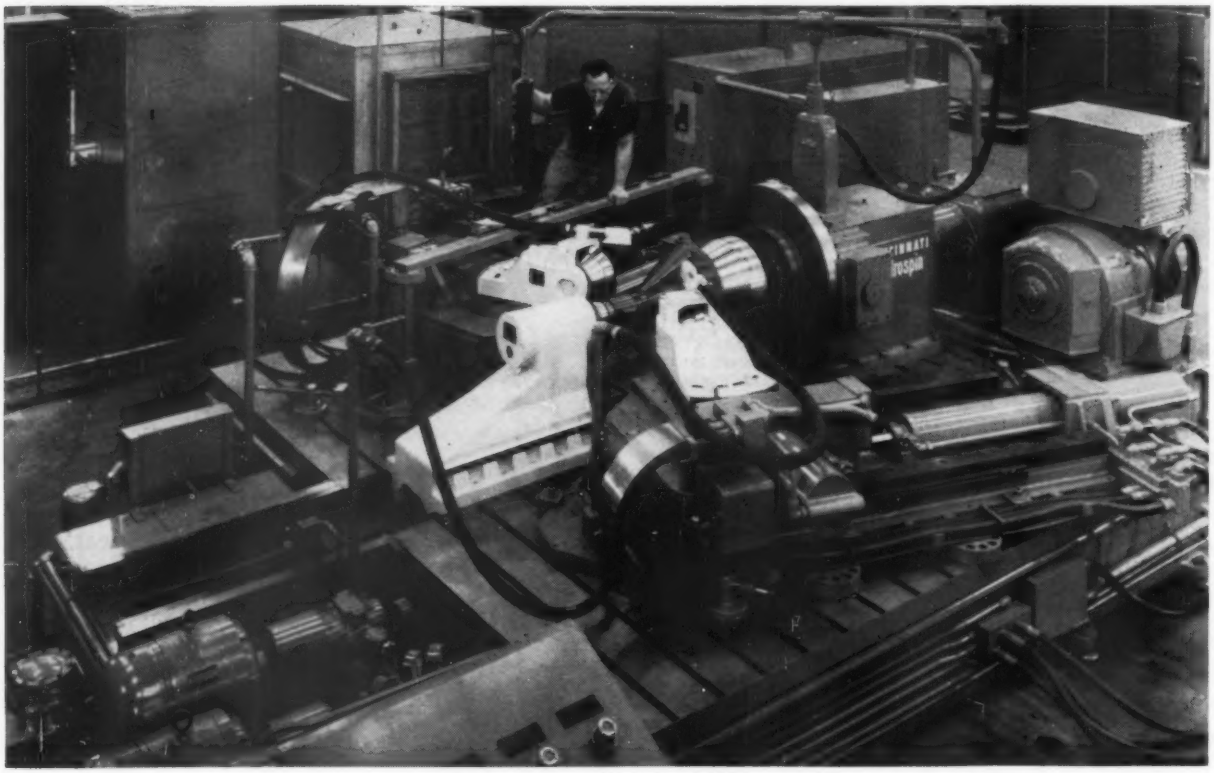
MODIFICATIONS

When grinding wheels wider than normal are used, a softer grade is usually called for. An example is a large cylindrical grinding wheel, 2 in. thick and, let us assume, 19A60-L5VG. If, for a certain job, you find a 4-in.-thick wheel is better suited, you will probably go to a one-grade-softer wheel, 19A60-K5VG, and in some instances even two grades softer, 19A60-J5VG, if the steel is unusually heat sensitive. Conversely, the narrower the wheel width, the harder the wheel grade that can be used.

Another guide to use, when you want a wheel with a coarser grinding action than that recommended, is to back off one or two grit sizes, leaving the grade the same. For example, if the table specifies 32A60-H8VG for a straight surface-grinding wheel, and you wish to first rough grind with a coarser-grit, fast-cutting wheel, you might back off two grit sizes. Standard grit sizes include 16, 20, 24, 30, 36, 46, 54, 60, 70, and 80 in the order of increasing fineness. Thus, two grit sizes coarser than 60 would give us the specification 32A46-H8VG, which should prove very well suited for heavy stock removal.

The lower the grindability index, the more difficult it is for a coarse-grit wheel to penetrate the steel and remove material; hence caution should be exercised when altering any specification listed under Group 5, and in some cases under Groups 2, 3, and 4.

These tables should simplify problems of grinding tool and die steels by directing you to the proper wheel. To be sure, no one has been able to simplify grinding to the point where rate of stock removal, optimum depth of cut, and the ideal wheel for every set of conditions can be predetermined. Nor have figures been published similar to those available for high-speed steel and cemented-carbide cutting tools with respect to cutting speed for various feeds and depths of cut. So many variables are involved in grinding that it is simply not practical to attempt to set up tables from which the precise wheel specification can be read off for any grinding job.



TOOLED FOR FINAL-SPINNING OPERATIONS on sample jet-engine turbine shafts, this 40-hp 42x50-in. duplex Hydrospin machine has an hydraulic tracer on the rear slide. Mandrels and roller tool rings are quickly interchangeable with tools for other jobs. Use of this equipment will eliminate need to cut many tons of chips annually

Cold power spinning saves material,

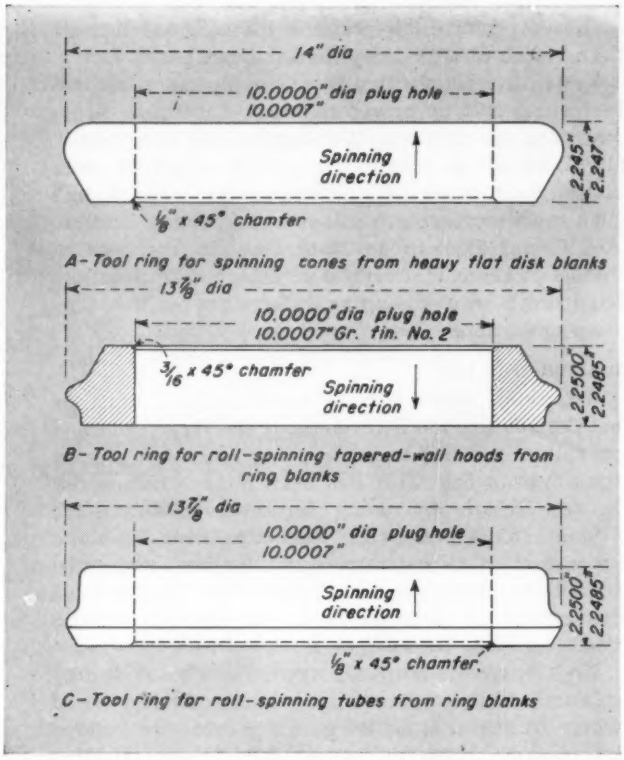
High-pressure, cold plastic deformation of metals to form hollow cones and cylinders from simple flat blanks or preforms can reduce cost of making some parts as much as 75%, while boosting strength 15% or more

KENNETH W STALKER, supervisor
Process Development Engineering, Jet Engine Department
Aircraft Gas Turbine Division
GENERAL ELECTRIC COMPANY

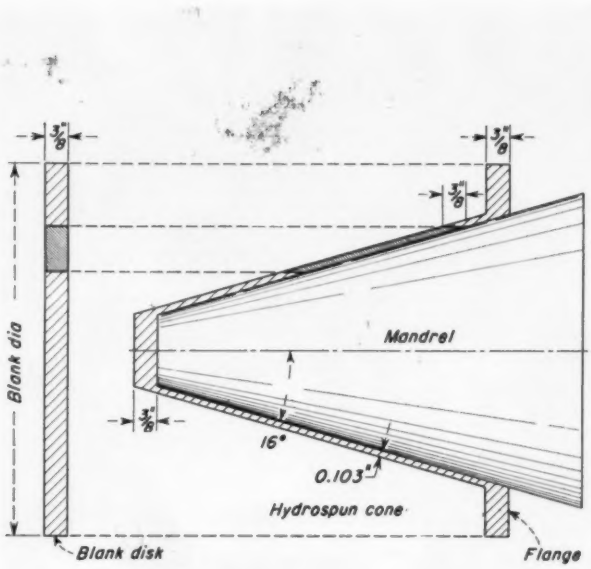
and KENNETH W MOORE, development engineer
Process Machinery Division
THE CINCINNATI MILLING MACHINE COMPANY

Cold working continues to attract interest, and hence leads to new developments, because the production man wants: (1) to make parts faster and stronger than by conventional machining, (2) to save material, ie, to achieve "chipless machining," and (3) to get the strength, hardness and other properties of heat-treated material, without using alloyed stock and heat-treatment processes, or at least to conserve alloys.

We have recently seen notable developments in cold deformation of metals—cold extrusion of steel, greater application of cold coining, sizing and upsetting. Now, the latest idea in cold working is to make hollow, symmetrical parts, either tubular or conical, from simple blanks. Procedure is similar in many respects to hand spinning, except that pressures up to 400,000 psi are used to "roll flow" the metal along a mandrel. Usually, the article is completed in one pass of the spinning rollers.



TOOL RINGS used on Hydrospin rollers are made from tool steel, hardened to 62-64 R_c, then finely ground and polished all over. Design varies with spinning operation to be performed, and sometimes is critical—especially when spinning thick blanks. For high-production jobs, cemented carbide tool rings may be used

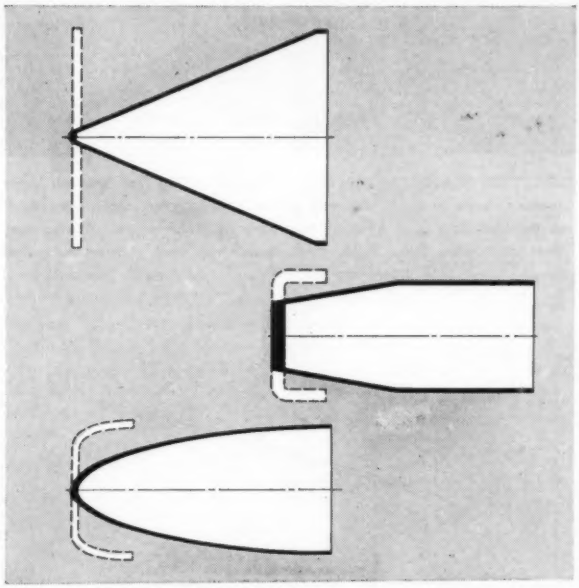


WHEN "SHEAR SPINNING" a cone from a flat disk with the Hydrospin machine, metal progressively is moved longitudinally under the heavy compressive stress imposed by the rollers, forcing the blank against the rotating mandrel. Reductions of 75% or more can be done in one pass, depending on metal characteristics

cuts costs

The Jet Engine Dept of General Electric's Aircraft Gas Turbine Div has devoted much effort to finding lower-cost methods of making hollow and tubular parts. Many such pieces exist in jet engines. They require use of hard-to-fabricate materials. Cooperative studies with the Process Machinery Div of The Cincinnati Milling Machine Co have shown that a wide range of parts can be cold spun rapidly and accurately at less cost than current methods. These cold-spun parts offer increased strength, resistance to fatigue failure, and hardness. The result has been the development of the Hydrospin machine (see page 190).

With high-pressure power spinning, parts are finished faster than is possible by conventional machining methods. Less metal is wasted than by being cut into chips. In some cases, more than half the original weight must be machined away as chips when producing highly stressed parts from forgings.



FLAT DISK BLANKS can be used when Hydrospinning straight-wall cones, but preformed cups or machined blanks usually are necessary to provide metal for tapered walls, for spinning tubular skirts on cones, or for spinning cups of irregular wall section

Chipless machining of many of these parts by cold plastic deformation limits machining to a few light cleanup cuts on surfaces that cannot be spun, and results in parts costing about 20 to 30% of those made from full-size forgings. In one case, change of

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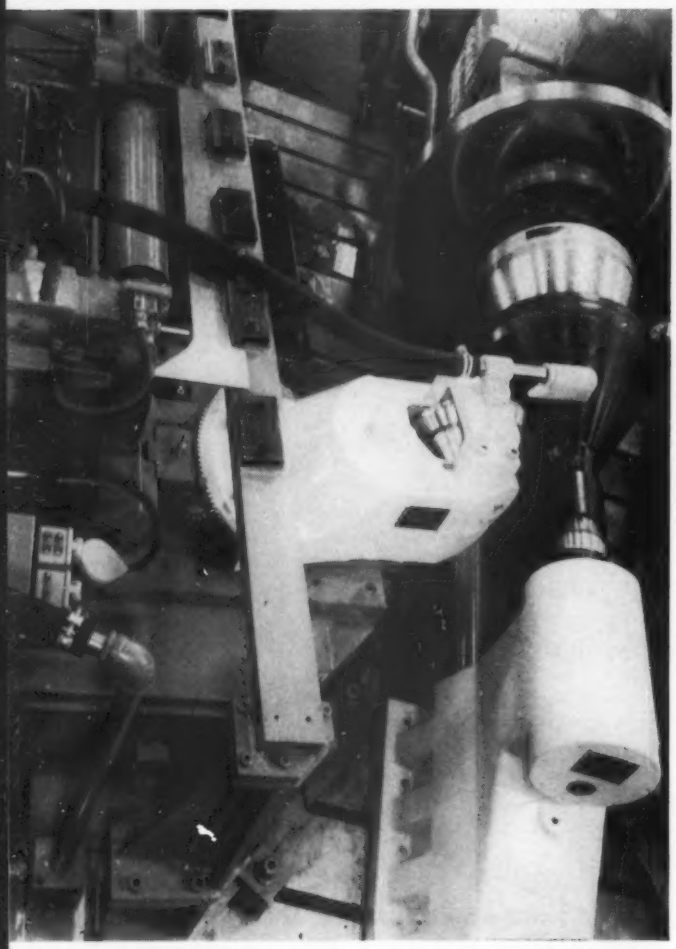
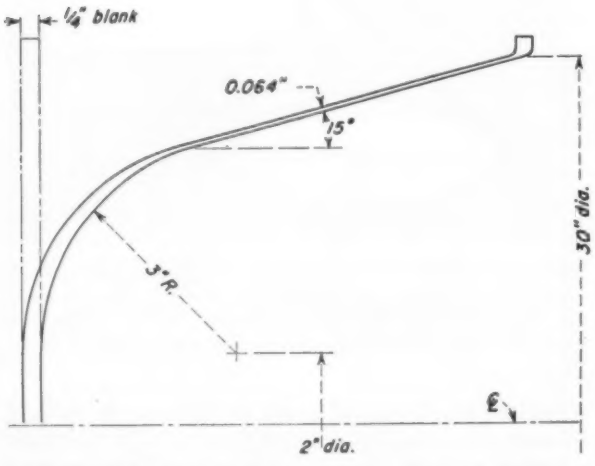
Cold power spinning . . . continued



CONTOUR TRACER is necessary when spinning curved-wall cups, stepped cones or multi-diameter tubes in production quantities. Radii on tip of tracer and nose of tool ring must be equal. Tracer templets are made from ⅜-in. thick, hardened and ground tool steel after shape has been developed with mild-steel templet stock



COMBINING ARCUATE BASE with straight conical wall, this bullet-nose cup easily is spun from a ¼-in.-thick disk of boiler plate at 250 rpm, with 0.020-ipr feed, using tracer-controlled roller. As blank is formed on mandrel, included angle changes gradually from 180° to 30° and wall is thinned according to sine rule, which is: part wall equals blank thickness times sine ½ angle

design to permit high-pressure spinning saved more than 100 lb of high-alloy material per part.

Tests have shown that most ductile materials can be formed cold by power spinning if sufficient pressure can be applied. We have spun successfully aluminum alloys ranging from 2S-0 to 75S-T4, mild steels, most types of stainless steels, Inconel, and such high-temperature alloys as Allegheny Ludlum A-286 and Timken 16-25-6. Only in the case of metals of hexagonal crystal structure, like titanium, has it been necessary to apply heat during the spinning operation.

TITANIUM SPUN HOT

Titanium, which is very hard to form, must be held at 900 to 1100 F throughout the Hydrospinning operation in order to achieve any reduction greater than approx 5%. This has been done satisfactorily in test setups by using Ray-O-Tube controlled Flamatic oxyacetylene gas torches to bring the blank up to temperature before spinning is started, then to hold its temperature as close to 1000 F as possible throughout the spinning cycle. At this temperature, titanium spins easier than does mild steel.

No lubricant is normally needed when hot Hydrospinning titanium, as the titanium oxides formed when the metal is heated in air provide the needed lubrication. However, when cold Hydrospinning other metals, both a lubricant and a coolant are necessary.

When selecting cooling and lubricating mediums for power spinning, two factors must be considered. Heat caused by rapid plastic deformation of the metal must be removed rapidly, and the contact area between the spinning rollers and the workpiece must be well lubricated to prevent galling.

Where unit pressures are low, as when power spinning the aluminum alloys, or when spinning from thin blanks, soluble-oil coolants provide adequate cooling and lubrication. However, when unit pressures are high, it has been found desirable to use separate cooling and lubricating media. In those cases, the coolant usually must have a high specific heat and should contain a good rust inhibitor. Water-base coolants with high heat absorption qualities, like Cimcool, work best. For lubrication when pressures are high, we have found it desirable to swab both the forming mandrel and the metal blank with a colloidal zinc suspension or a molydisulphide paste. The lubricant must be of a type that will not be washed off by the heavy flow of coolant. In extreme cases, for example on an A-286 alloy jet turbine shaft, the blank should also be coated with an inactive phosphate by dipping prior to spinning.

FORCES IN SPINNING

Forces applied against the forming rollers when Hydrospinning vary almost directly with the yield strength of the material being formed, and with its thickness. On each side of a duplex machine installed in the Jet Engine Dept at the General Electric plant in Evendale the maximum available force is sufficient to roll-form a ¾-in-thick disk of annealed AISI 4130 steel to a 60° included-angle straight-wall cone,

or to roll-form annealed AISI 4130 tubing with ½-in.-thick walls through a 60% reduction in one pass. When spinning a ⅜-in.-thick disk of aluminum alloy to a 30° included angle in one pass, the required force against the rollers is only a fraction of that available.

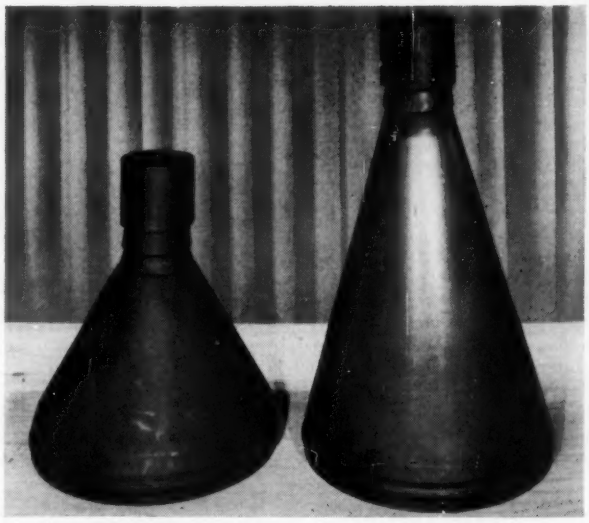
Despite the high forming pressures used, microstructure analysis of stressed parts formed by Hydrospinning shows no evidence of fractures developing in the crystalline structure. So far, tests on parts rolled with reductions as high as 70 to 80% show no material reduction in physical properties. In fact, in almost every case, the plastic deformation of the metal is accompanied by a material increase in tensile strength and in fatigue resistance. The rolled surface is work-hardened considerably, and is burnished to a very smooth finish.

EFFECT OF INCLUSIONS

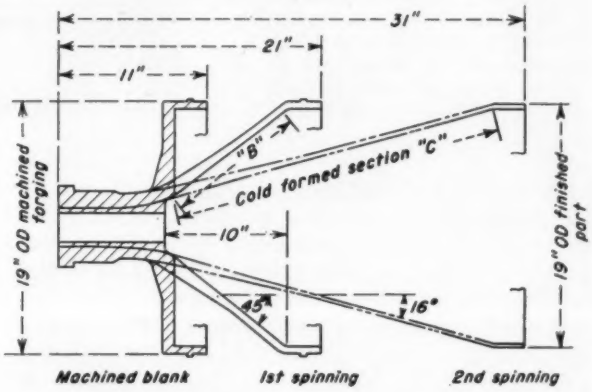
Inclusions of dirt or slag in the metal blank will cause cracking or splitting of the part as it is formed, but scratches, machining marks or chatter marks do not cause difficulty if the forming operation is not severe. However, if the preform is of critical shape and there are high strains when spinning is started, tool marks or scratches may lead to stress concentrations and cracking when the rolls contact the blank. Tests made by General Electric metallurgists indicate that when critical, expensive parts are to be Hydrospun, it may be desirable to use vacuum-melted metals to insure sound blanks. This is particularly true of A-286 alloy and titanium, which are susceptible to inclusions and segregations. Undesirable separations appeared in the surfaces of some Hydrospun A-286 alloy parts, because of segregation in the alloy.

Finish achieved on the spun part depends upon the material being worked and the rate of feed used. It also is affected by roller design, particularly when spinning thicker blanks. Feeds used have ranged from 0.0005 to as much as 0.168 ipr, but usually range between 0.010 and 0.080 ipr. For production operations, where a very fine surface finish is not required, feed rates generally are 0.030 to 0.050 ipr. Hardness of material does not appear to be a controlling factor in determining the most desirable rate of feed, nor is spindle speed much of a factor. For production operations, most materials seem to Hydrospin best in the speed range above 1000 sfpm.

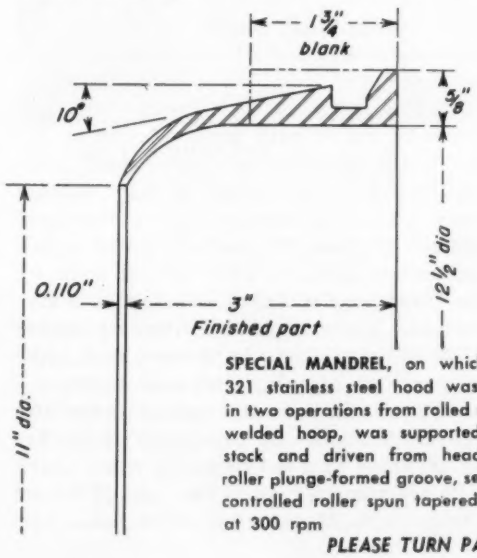
Blanks for Hydrospinning operations may be made from mill-rolled sheet and plate stock, forgings or castings. Shape of the blank in each case is determined by the operation to be performed and the metal needed in the various sections of the Hydrospun part. If forgings and castings can be made to close tolerances, they can be spun without premachining—providing scale is removed from their surfaces by shot or sand blasting, or by pickling. Scale on such blanks does not appear to crack off as the blank gradually moves under the forming rollers. On the other hand, hot-rolled mild-steel boiler plate with mill scale still attached has been Hydrospun successfully to a fine finish, without the scale being embedded in the work surface. The



HEAVIEST PART Hydrospun to date is A-286 alloy turbine shaft for jet engine. Two spinning operations were necessary to form finished shaft (right) from premachined forging. The 60° included angle of intermediate form (left) later was changed to 90° to improve breakdown conditions in final spinning operation



TWO SPINNING MANDRELS are required when Hydrospinning turbine shaft from forged and premachined blank. Dimensions shown are approximate. Originally, shaft was machined direct from large, expensive forging. Change to Hydrospinning eliminates need for making more than 100 lb of chips and materially reduces load on expensive boring mills



SPECIAL MANDREL, on which this type 321 stainless steel hood was Hydrospun in two operations from rolled and Heliarc-welded hoop, was supported from tailstock and driven from headstock. First roller plunge-formed groove, second tracer-controlled roller spun tapered-wall down at 300 rpm

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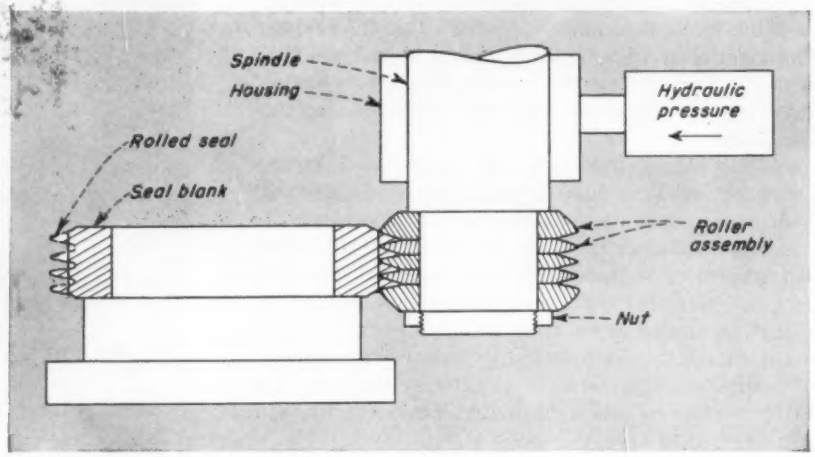
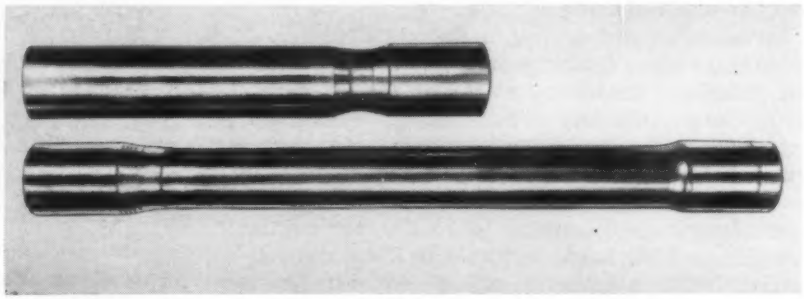
Cold power spinning . . . *continued*



ROLL GROOVING of labyrinth rings for jet-engine rotary air seals first was tested in setup on large vertical boring mill in the Metalworking Laboratory at General Electrics' plant in Evendale. Process develops smooth, hard, burnished surfaces even on soft, tough, stringy materials virtually impossible to machine without tearing



CENTER SECTION of the 12-in.-long, 0.225-in.-wall, 2.00-in. OD tubular blank (above) made from AISI 4340 steel was cold rolled at 100 rpm in setup on vertical boring mill to form shaft (below) with hubs at each end. Wall thickness was reduced 55% to 0.100-in. in one pass and hardness was increased from 15 R_c to 35 R_c

scale on these blanks appears to break away from the metal and fly off before the blank passes under the rolls. However, precleaning is recommended, to prevent flakes of scale from accumulating in the lubricant which gathers on the rolls.

When Hydrospinning cones from flat disks, maximum angle of reduction that can be achieved in one pass of the rollers depends upon the workability of the metal and the thickness of the blank. The smallest included angle now considered practical is approx 20° in aluminum, 30° in stainless steel. Thickness of the finished wall when spinning a cone from a flat blank equals the thickness of the blank multiplied by the sine of ½ the included angle of the cone. Thus, when Hydrospinning to an included angle of 30°, the reduction in wall thickness is approx 74% since the sine of 15° is 0.25882. Thickness of the spun wall of a cone can be varied approx 10 to 15% by adjustment of roller path with relation to the mandrel, when it is necessary to achieve small deviations in wall thickness, or to roll a slight general taper into the wall. If a heavier taper is required, or if variations in shape are necessary, the blank must be preformed to suit. This can be done by cupping the blank in a spinning lathe, or in a Hydroform machine. Tapers produced from a properly preformed "flower pot" shape have been held within 0.001-in. per inch of calculated wall taper.

Preforms are machined from forgings or castings when flange thickness to be developed is thicker than can be provided by a flat blank, or when heavy integral hubs are required, as in the case of the jet engine turbine shaft. Machined preforms also may be required when difficult re-entrant shapes must be spun. In machined preforms, the shape of the finished part is telescoped back into a shorter shape, which can be machined economically from a shorter forging or casting than would be required for producing the part.

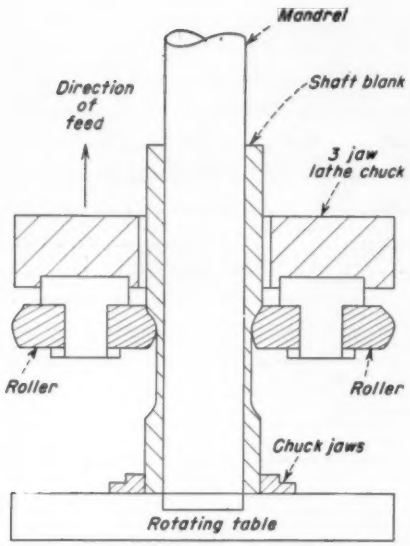
METHODS FOR MAKING CONES

Compound cones, with two or more progressively smaller included angles, and stepped cones can be Hydrospun in several ways with a duplex machine:

1. The several angles can be rolled in separate passes, using one or both rollers to form each conical wall on stepped or separate mandrels.
2. One roller can be set to roll the first cone and then, in the same setup, the second roller can be brought into use to roll-spin the second cone.
3. One or both rollers can be tracer controlled to traverse the entire length of the part.

Stepped mandrels are necessary for the last two methods. The use of the tracer controls is suggested when much production is involved. However, when blank thickness is ½ in. or more, there may be some difficulty with using the same rollers to form different included angles of cone. Without correctly shaped rollers when roll-spinning thick blanks, the nose of the roller may undercut the blank and cause a burr, leaving a rough surface on the workpiece.

Roll-spinning of tubes presents somewhat different problems than does the "shear spinning" of conical shapes from flat or preformed blanks. Percentage of reduction when rolling a straight-wall tube on a Hydrospin machine is simply a matter of

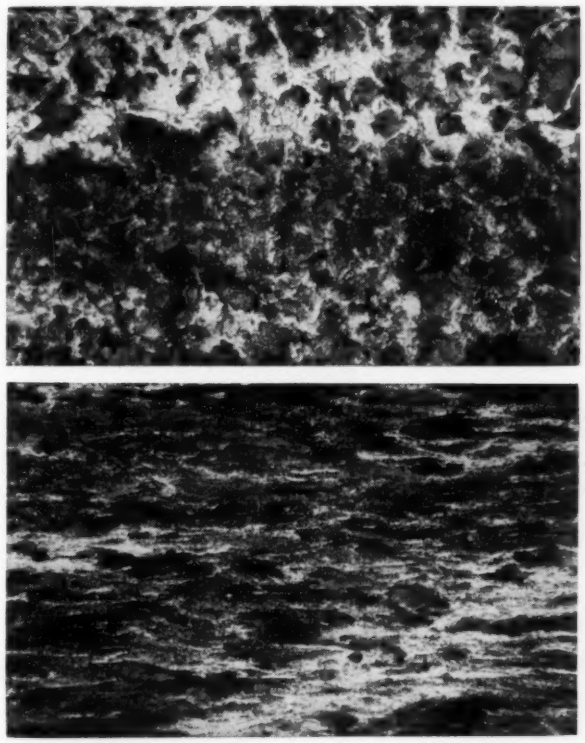


TEST SETUP ON BORING MILL for cold draw-rolling hollow shafts in General Electric's Metalworking Laboratory used rollers mounted on jaws of 3-jaw universal chuck. Chuck was supported from and moved by turret head while blank was turned by table of mill. Tubes from aluminum, mild steel and AISI 4340 steel were rolled during tests, some with cold reductions up to 80% of wall thickness. Feed was 0.750 ipm

Effects of Cold-Working Alloy A-286 by Roll Forming*

CONDITION OF PART	PROPERTIES AT ROOM TEMP	PROPERTIES AT 1200 F
Solution Treated and Aged		
Tensile Strength, psi	155,840	110,700
0.2% Yield Strength, psi	93,090	87,630
0.02% Yield Strength, psi	77,220	74,530
Elongation %	21.3	8.0
Solution Treated, Cold-Worked and Aged		
Tensile Strength, psi	182,640	124,730
0.2% Yield Strength, psi	160,200	115,150
0.02% Yield Strength, psi	132,050	90,100
Elongation %	10.3	7.0

** Allegheny Ludlum Alloy A-286 is a chrome-nickel, titanium stabilized high-temperature alloy which can be solution-treated and aged to operate in temperatures as high as 1200F. It is being used for a number of gas-turbine parts, including parts for jet engines.*



THE 250X PHOTOMIGRAPHS above show (top) typical grain orientation of annealed AISI 4340 alloy steel, and (bottom) grain size after draw rolling of tube to 55% wall reduction in test setup on boring mill. Note that cold draw-rolling elongates the grains and flows them parallel to direction of rolling. Finish is good

roller design, strength of the mandrel and of the spun tube, and power available. In addition, by setting the slide at an angle with the mandrel, or by using tracer control, a taper-walled tube can be rolled easily.

Maximum reduction in wall thickness to date, when roller-spinning AISI 4130 steel tubes with the forward-extrusion technique (that is, spinning in the direction of metal movement), is 91%. The operation involved rolling a 0.160-in.-thick wall down to 0.0155-in. thickness. The metal, after this heavy reduction, was extremely hard, grain elongation was extreme, and the part tore after about 5 in. of spinning.

MULTIPLE ROLLERS

Where the tube to be Hydrospun is longer than approx three times its diameter, the use of two opposed rollers is essential to keep deflection of the mandrel from causing inaccuracies in wall thickness. In some cases, where the mandrel is quite small in diameter, we have found it desirable to position two rollers on the rear slide and one on the front slide, so they will support the workpiece between three points and eliminate any tendency for the mandrel to climb from between the centers of the rollers.

By using rollers of proper design it is possible to roll truncated cones with smaller included angles from ring blanks, using the tube-rolling technique, than is possible by rolling the cone from a flat disk. Truncated cone blanks can be spun up the cone from the small end, annular-ring blanks down the cone as in the case of the dish-shaped hood (sketch). In these cases, the rollers must be designed to do a "gathering" operation—as is done in hand spinning—while accomplishing the metal thinning function of Hydrospinning rollers.

Intermediate annealing of workpieces has not, to date, been necessary when Hydrospinning parts requiring two or more passes of the rollers, until the metal reduction has exceeded approx 90%.

TIME STUDY SHEET

Class. _____ Customer _____

Order No. _____ Pcs. on order: _____ Part Name _____ Part No. _____

From: Oper. # _____ Barrel No. _____ Est. Rate: _____ Pcs/Hr. _____ Hr. Min. _____

To: Oper. # _____ Barrel No. _____ Std. Rate _____ Pcs/Hr _____ Hr. Min. _____

Date: _____ Observer: _____ Material: _____

ELEMENTS	Time in Min.	Net
TOTAL MINUTES:		
Total pieces in Barrel: _____		
Pcs./Hour = Total pcs. / Total min. X 60 = _____ Pcs/Hr		
Remarks:		

OPERATING DATA	Barrel			
Pieces per barrel				
Running time				
Degrease parts				
Degrease boxes				
Dip in Rust-Ban				
Add Rust-Ban, Quarts				
Media:				
Media cleaner:				
Cutting Compound:				

TIME-STUDY SHEET is used to measure and evaluate each new job or any change in operating conditions. Result of study plus appearance of barrel-finished parts decides whether process is feasible; establishes production that can be expected

Experience file saves barrel-finishing time

Hartford Machine Screw Co, Hartford, Conn, has made major production gains and sizable savings over the last few years through very imaginative use of barrel finishing. One way to capitalize on experience is to *record it*; then refer to the record when similar jobs come along. This saves time and avoids expensive guesswork or trial and error. Here is what to record; also how to determine whether barrel finishing is practical for a specific job

For every new job that comes along, the Operation Sheet Section of the Planning Dept sends a copy of every operation sheet that calls for any form of polishing or burring to the Barrel Finishing Dept. When the new OS arrives, the foreman of Barrel Finishing does two things: He gets samples of the part and he goes to his extensive experience file and draws out the cards on similar jobs that have previously been processed.

From these cards and the nature of the new part, he decides what operational procedure is required to process the part. Then he runs some of the sample pieces, either separately in a small barrel or together with a production run of other parts in a larger barrel. He does a time study on the sample run and records the conditions and time. After the initial run, he evaluates the result and makes any changes in the process that might be necessary for this specific part. Then he runs the remainder of the sample.

These test runs give him the information he needs to decide whether the job is suitable and practical for barrel finishing, and he advises Planning accordingly. In any case, a description of the piece and every element of the job is recorded on a card for the experience file. Thus, repeat jobs and pieces that are very similar to previous work need not be tested. An answer is right at hand. As old jobs are repeated, variations in technique against the original method are recorded on the card.

At present, the file contains more than 400 cards and represents a wide range of problems. It saves countless hours of time and testing. New jobs can be estimated with a minimum of delay and doubt.

CUSTOMER _____

CLASS _____ PART NO. _____ ORDER NO. _____

OPERATION _____

BARREL _____ SPEED _____

NO. PCS. _____ WEIGHT _____

MEDIA _____ WEIGHT _____

COMPOUNDS _____

WATER LEVEL _____

OPERATING INSTRUCTIONS

STEP 1 _____

STEP 2 _____

STEP 3 _____

STEP 4 _____

STEP 5 _____

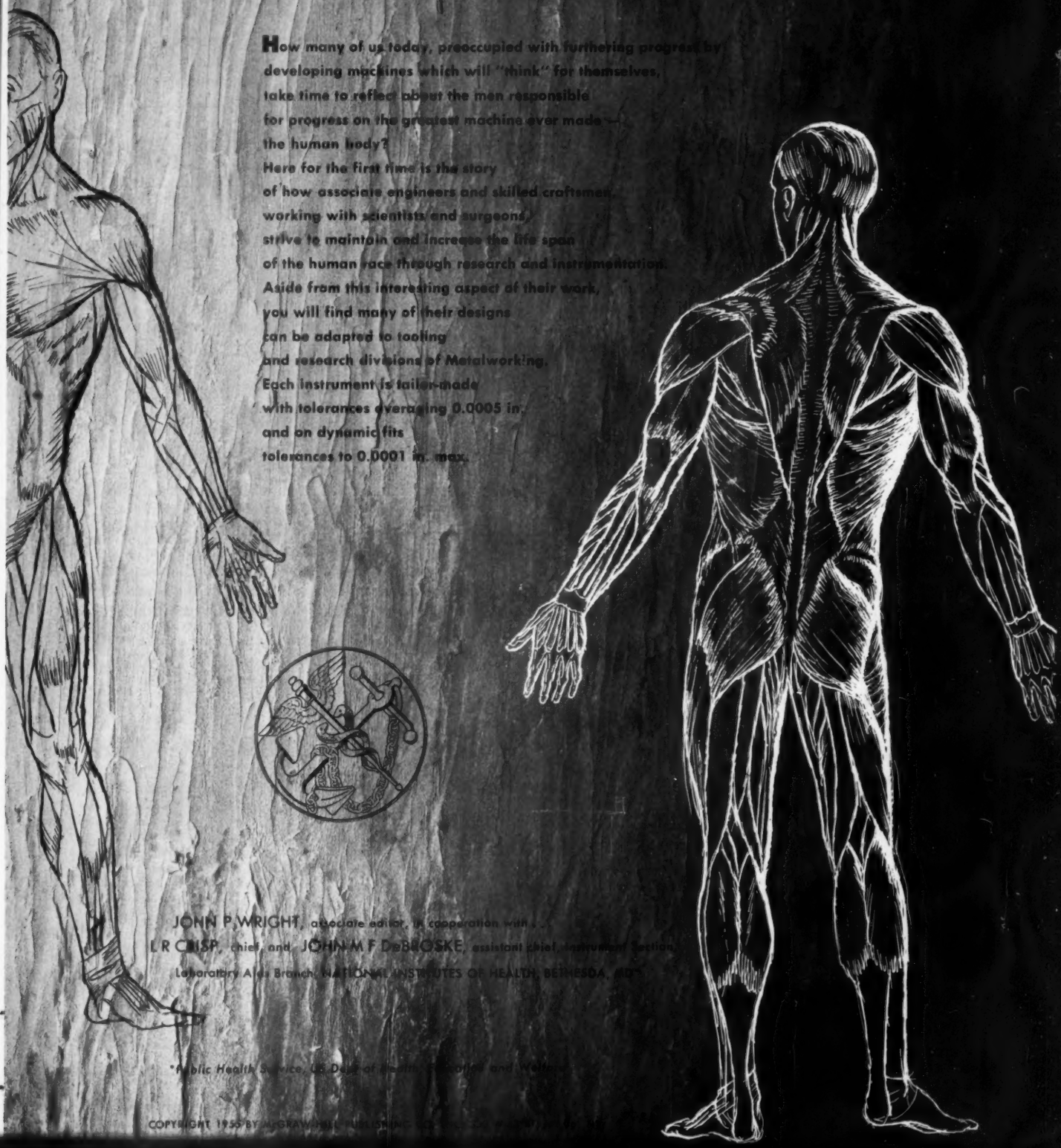
TIME _____

EXPERIENCE-FILE CARD plus drawing of part provides complete description of all the elements of the operation. Thus, new, similar jobs and repeat orders for the same job can be estimated and set up with a minimum of delay as well as a sound confidence in good results

American Machinist
SPECIAL REPORT NUMBER 392

tailor-made instruments for the greatest machine ever

How many of us today, preoccupied with furthering progress by developing machines which will "think" for themselves, take time to reflect about the men responsible for progress on the greatest machine ever made — the human body?
Here for the first time is the story of how associate engineers and skilled craftsmen, working with scientists and surgeons, strive to maintain and increase the life span of the human race through research and instrumentation.
Aside from this interesting aspect of their work, you will find many of their designs can be adapted to tooling and research divisions of Metalworking.
Each instrument is tailor-made with tolerances averaging 0.0005 in. and on dynamic fits tolerances to 0.0001 in. max.



JOHN P. WRIGHT, associate editor, in cooperation with L. R. CRISP, chief, and JOHN M. F. DeBROSKE, assistant chief, Instrument Section, Laboratory Aids Branch, NATIONAL INSTITUTES OF HEALTH, BETHESDA, MD.*

*Public Health Service, U.S. Dept. of Health, Education and Welfare

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TAILOR-MADE INSTRUMENTS FOR THE

The tailors...

At the National Institutes of Health, there is an instrument section, which was founded in 1947 to meet the demands of 600 to 700 scientists and surgeons doing fundamental research in the seven Institutes. The group of 39 men in the instrument shop comprising mechanical and electronic engineers, instrument and toolmakers, electronic technicians, glass technologists and glass blowers, who design and make instruments for basic research to aid the scientist in his quest for undiscovered knowledge. The relation of the instrument group to the Institutes as a whole has been established to function in applying science to science itself. It should be understood that its activities in research are basic and must be dedicated to supplying a valuable service center for all experimental research.

A further important function that the instrument section performs is to relieve the specialist engaged in research. Because of this service, the scientist is free to pursue his own specialization and to become more skilled in the use of instruments, rather than an expert in designing and producing tools of his profession. This is particularly true in the non-physics fields, but also applies to some aspects of physics.

One aim of this section is to keep costs down. Whenever apparatus or equipment is available on the market it is purchased rather than duplicated. None of the projects developed at the Institutes is ever marketed, but complete designs of every instrument can be had upon request. In some instances where the *immediate* demand for a commercially available instrument is great enough, this section might undertake to build it.

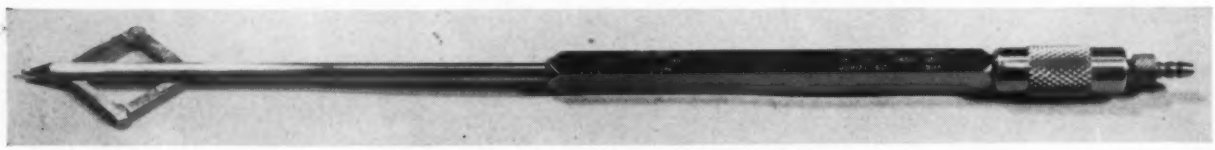
Shop section

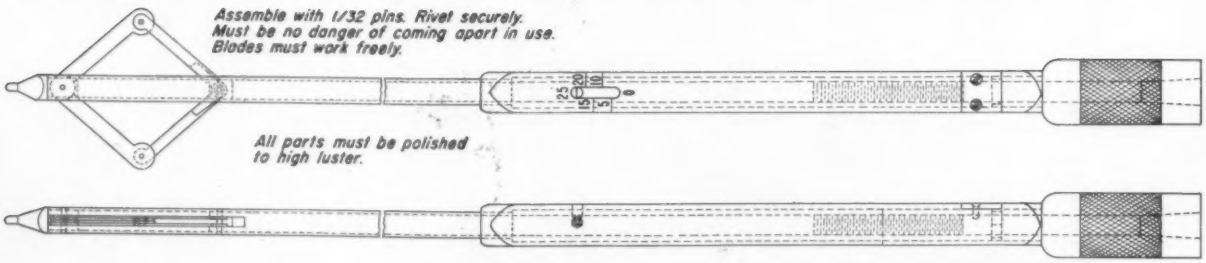
Essential to the Institutes are the shop facilities required for its various needs. It includes precision tools for all manner of working metals, plastics, glass and any other materials useful in research. Equipment is selected from a standpoint of versatility and capacity for developing the mechanical designs of special apparatus with particular reference to simplicity, ease of construction, and precision—a prime factor in laboratory dependability. In short, the shops are responsible for many of the laboratory arts.

Procedure for building an instrument

Whenever an investigator receives authorization to have a particular instrument built, generally one man from the instrument section is assigned to build and aid in the design of the apparatus. During its development, he will work very closely with the scientist until the instrument has been perfected. Many times during initial development the instrument maker will participate in conferences and sit in on actual operations to observe the hand techniques which the instrument is intended to replace. This procedure gives the man a clear-cut picture of the problem involved. Experience has shown that this method has resulted in creation of a more satisfactory and economical instrument. It also accounts for the exceedingly high shop morale because it permits the men to take real pride in their work, and also carry out their assignments unhindered from start to finish.

• THE HEART...




Assemble with 1/32 pins. Rivet securely.
Must be no danger of coming apart in use.
Blades must work freely.
All parts must be polished
to high luster.

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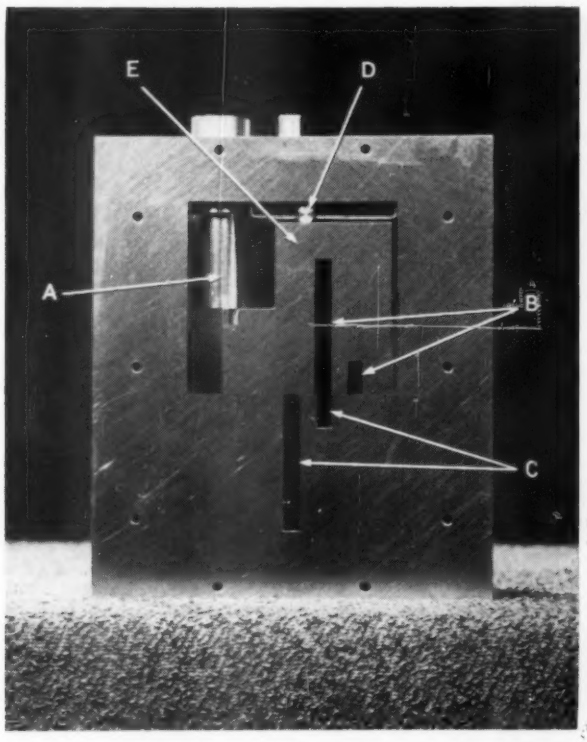


Clausen diffusion cell . . .

forms precise sharp boundaries between fluids of two different concentrations. It permits measuring distance between boundaries by means of an optical system. Cam *A* accurately aligns slots *B* with slots *C* to any desired position. Leaf spring *D* exerts sensitive tension on sliding gate *E* to permit free movement between metal-to-metal contact. Fluid is fed through two openings to sliding gate which equalizes fluids and permits analysis as they drop down slots. At this stage an interferometer and a camera is used to photograph speciments through plate. Instrument was built from 316 SS, and was ground and lapped parallel all over between ¼ and ½ wave length for unrestricted flow of fluid

Dilating knife . . .

with a 5/32-in.-dia shank has cutting blades which can be expanded to 0.984 in. dia. Knife is made entirely from 316 stainless steel because of all materials tested, it was found to have best anti-corrosive properties. Note vernier in handle to show width of blade expansion. Cutting blades are made from 1/64-in.-thick spring-tempered stainless and have leading edges sharpened to razor-blade keeness. Knife is used for treatment of heart disease (pulmonic stenosis—in children, this is one cause of "blue babies") in the area where a large artery carries the entire output of blood from the heart through a valve to the lungs. In children, the opening in this valve is extremely small, 0.080 to 0.120 in. Since entire flow must pass through such a small opening it places an abnormal strain on the heart. Collapsed knife is passed inside heart and blades are opened to 0.60 or 0.80 in., then pushed upward cutting small opening into a much larger one. Folding feature of knife necessitates only a tiny hole in the heart, thus preventing massive loss of blood

Why instrument section?

"It is highly desirable that research shall become as productive as possible toward increasing our fundamental knowledge in science.

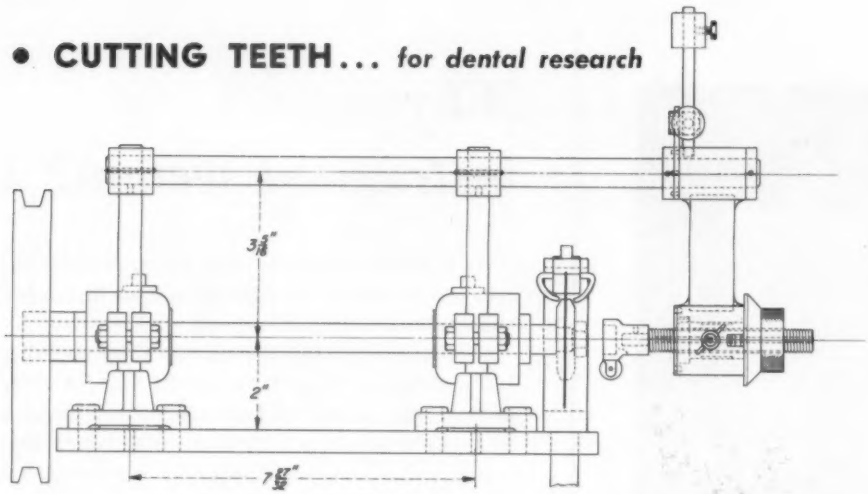
"One way of accomplishing this is by applying the division of labor in a special way. I refer to the great amount of time and energy devoted by many researchers to devising and constructing experimental equipment, such as measuring devices for observing and recording, means for increasing the acuity or reducing the thresholds of perception, an apparatus for the precise control of certain experimental quantities.

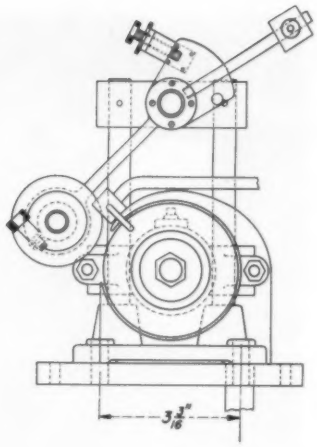
"This job in many instances is done by scientists with inadequate experience and training in instrumentology. This term as here used means the planning of all instrumental means capable of attacking a problem, and the devising, designing and constructing, if necessary, of the instrumental and manipulative aids required in the research. The practice of instrumentology, so defined, frequently results in a device so widely applicable that it later becomes a commercial product; but its immediate purpose is the fulfillment of an important function in basic research. The field is vast and alluring, and its fascination easily diverts a specialized scientist from his principal interest. He should not, to do justice to his special competence and productivity, be so diverted. By the aforementioned "division of labor," details of which will presently be set forth," he should be relieved of most of the exacting work, in a task for which others may be far better qualified."

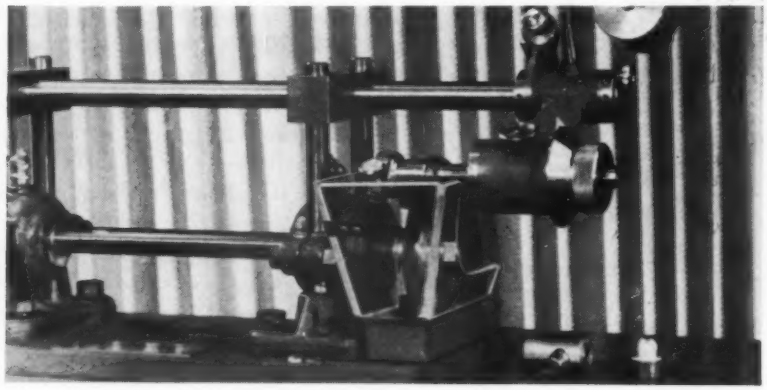
Quote taken from a report to the National Science Foundation, "Instrumentology in Basic Research," by Paul L Klopsteg.

TAILOR-MADE INSTRUMENTS FOR THE

• CUTTING TEETH... *for dental research*

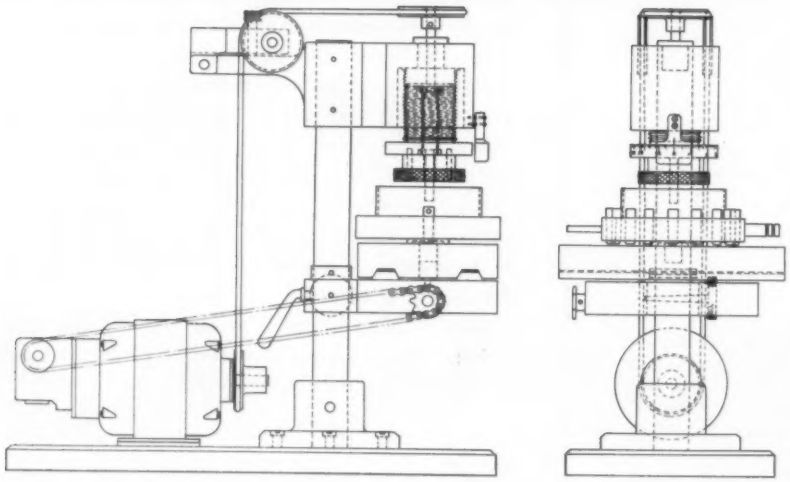


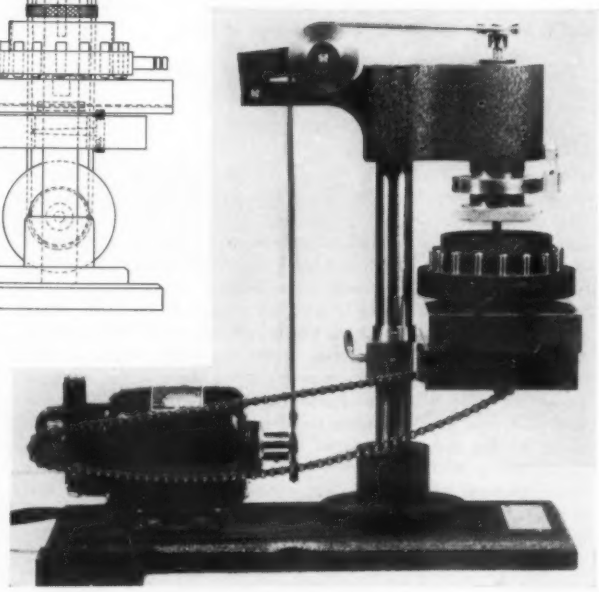




Cut-off machine...

has counterbalance arm and micrometer calibrating screw, graduated to 0.001 in., for feeding work into cutting wheel. Rubber wheel 0.015 in. thick cuts off 12 to 14 specimens of human teeth 0.020 in. thick in the form of wafers. Tooth is mounted in workholding ring and held securely with plaster of paris. Ring is then held in split collet. Rubber bonded wheel 3 in. dia runs at 3436 sfpm and gave excellent results as it prevented chipping of porcelain. Feed is held to maximum thru observatior under microscope for chipping of surfaces

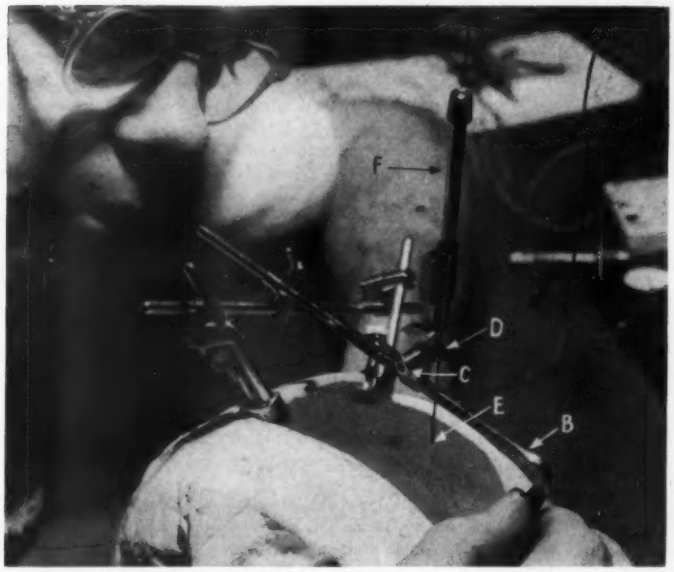


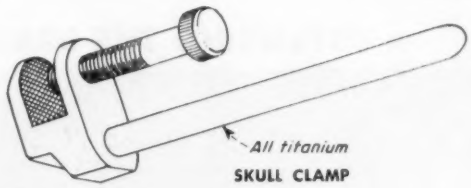


Polishing machine...

holds each wafer-thin tooth specimen on a vacuum seat. Sprocket chain reciprocates table through a drum cam in a longitudinal direction. Vernier regulates downfeed in increments of 0.001 in. Diamond wheel cuts and polishes faces of tooth section to surface finish less than 5 mu. in. rms. Sixteen tooth sections are polished at each setup until specimens are 0.003 in. thick, without chipping the porcelain or dentine. Cycle time is approx 5 min., and plain water is used for polishing to avoid embedded foreign particles. Power is furnished by a 1/50-hp Bodine split-phase motor for spindle and through a 90:1 reduction gear to worktable

• EXPLORING THE BRAIN . . .

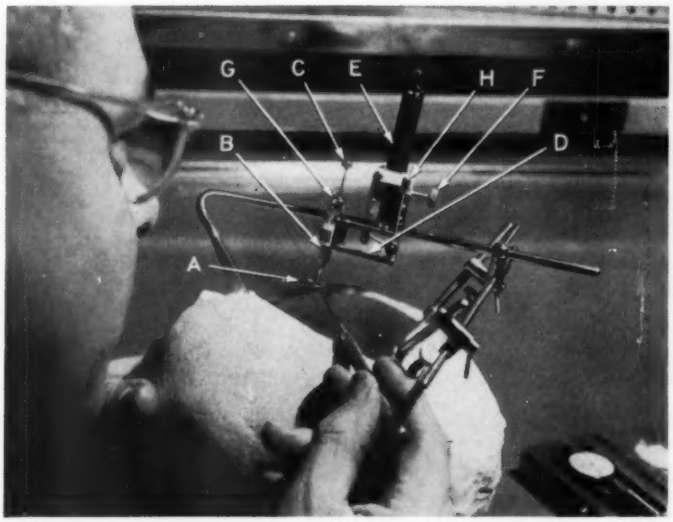




SKULL CLAMP

Electrode carrier . . .

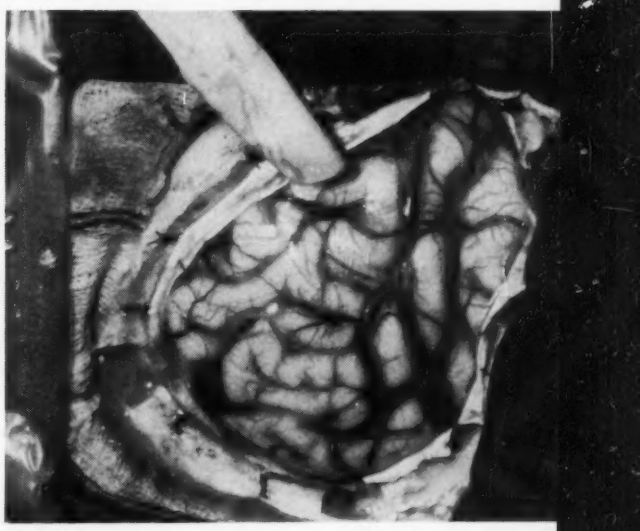
for depth recording and stimulation in human patients during brain surgery. It is further used to reproduce readings at any subsequent time within the brain in the same location on the same patient or on several patients. Instrument made of pure titanium can withstand the high temperature and pressure of steam sterilization. It is readily attached to patient's skull and easily removed by means of adjustable clamps. Thicknesses of human skulls vary from ⅜ in. to ¾ in. Electrode holder is freely movable in all directions along horizontal bar *B* graduated to a total of 100 mm. It can also be rotated through the focal point *C*, and arc *D* graduated in degrees. The location of the stimulating or recording electrode tip *E* can be calibrated through the scales on horizontal bar *B* and the vertical spindle *F*. Nylon bushing for vertical spindle provides a sensitive sliding fit for entire travel of electrode. Stainless steel 347 hypodermic tubing is used for electrode and dipped in "tygon" to act as an insulator



Micro-electrode holder . . .

mounted on same carrier has a ring seat *A* designed to ride on top surface of brain for recording a single cell action. The micro-pipette electrode *B* is an integral part of ring assembly which permits it to rise and fall with the pulse beat of human brain through a stroke of approx 5 mm.

This arrangement permits pipette to be independently fed down through center of ring for penetrating a particular brain cell to a given depth and then maintaining this depth by means of the ring seat. The human brain cell averages 50 microns in thickness. Releasing lever *H* attached to fulcrum arm *D* is for manually raising and lowering ring assembly. Leadscrew *C* with a ½-mm pitch provides independent control for sensitive feeding and seating of ring. Vernier scale *F* calibrated for 0.001-in. accuracy is male member of dovetail slide. Female dovetail is made from nylon to provide frictionless movement. Thumbscrew *F* has a worm which meshes with helical rack on back of vernier scale for governing fine penetration of brain cell with pipette electrode. Silver wire *G* immersed in potassium chloride contained in chamber of glass pipette is used to carry continuity of electrical current from pipette tip. Pure titanium and nylon was used exclusively to make this instrument

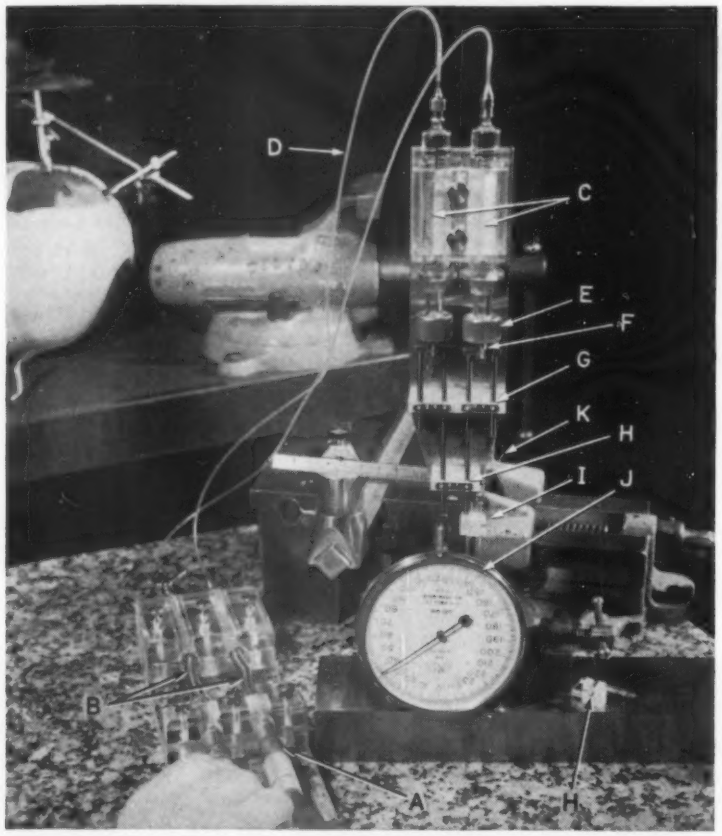


Exposed human brain . . .

with skull patch removed and protective membrane still attached but coiled out of the way (upper right). This is the same photo of the operation the instrumentmaker witnessed to gather necessary information for building the Micro-electrode holder. Ring seat riding on top surface of any one of these pulsating brain cells keeps electrode to predetermined depth

TAILOR-MADE INSTRUMENTS FOR THE

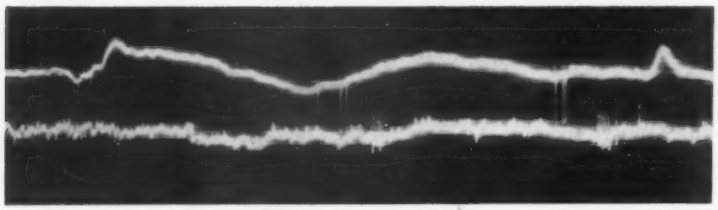
• EXPLORING THE BRAIN ... continued



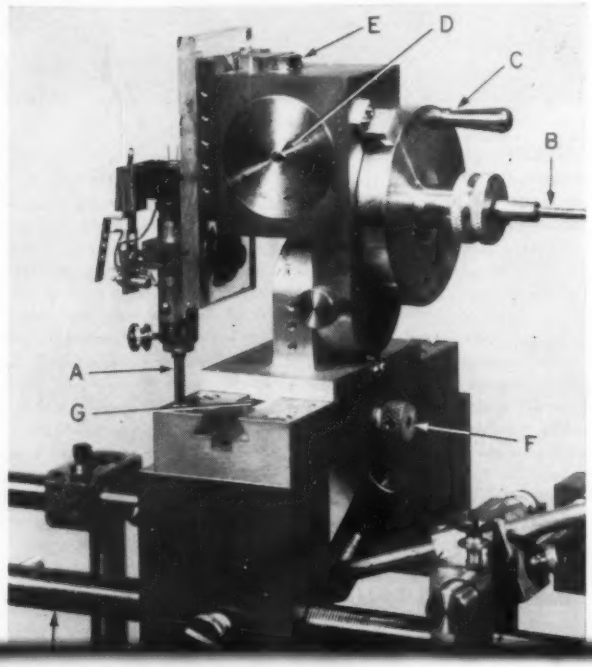
Checking the accuracy ...

of a double micro-manipulator used to record potential discharge from single cortical cells simultaneously at different depths in the cortex. It is also used for two-cell study by penetrating a good cell and a deficient cell (epileptic) with each electrode to measure the amount of difference in electrical output. Micrometer *A* drives plunger of a tubercular syringe *B*, which is filled with non-compressible liquid paraffin or mineral oil. This system is connected to another 5-cc syringe *C* by polyethylene tubing *D*. Entire hydraulic system is kept free of air bubbles. Plunger of syringe *C* is fitted into a screw cap *E* which connects with shaft *F*. Two arms of the shaft are supported in V's of a teflon bar and spring-loaded thrust plate *G* for guiding and preventing rotation of shafts. The two independent long shafts are further guided by an additional teflon bearing, and attached to the ends of these shafts are two micro-electrode holders (micro-pipette) *I*, both of which can be rotated in all directions.

Displacement of plunger *B* activates plunger *C* as well as the micro-electrode holders. Indicator *J* shows that turning the micrometer spindle 0.001 in. causes an advancement of micro-electrode holder approximately 4 microns (0.00016 in.) or a ratio of 1:5. The two units are placed side by side so that movement of holders can be controlled independently. However, rotating the holders permits the tips of the two micro-electrodes to be adjusted to a minimum center-to-center distance of 0.079 in. The electrodes are connected separately to the grids of two cathode followers through a silver electrode *K*. Nylon bearings and supports were used because of its sterilization and dielectrical properties



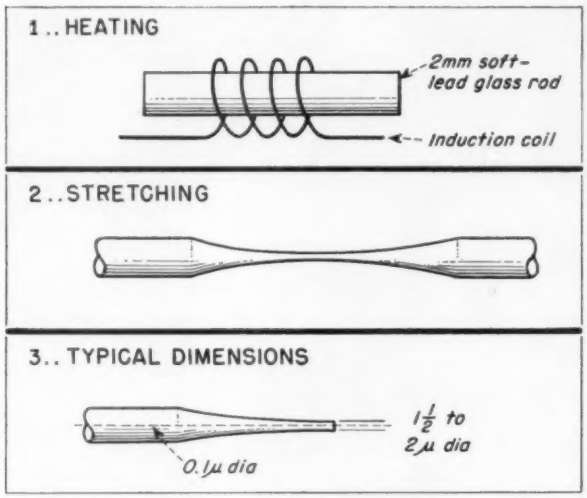
INDEPENDENT READINGS taken by this instrument of two different levels of cortex in a cat and recorded on an oscilloscope. Spikes in record represent electrical impulses generated by single cells and show that cortical cells do not discharge synchronously. However, there is a definite relationship between their activities.



Micro-manipulator ...

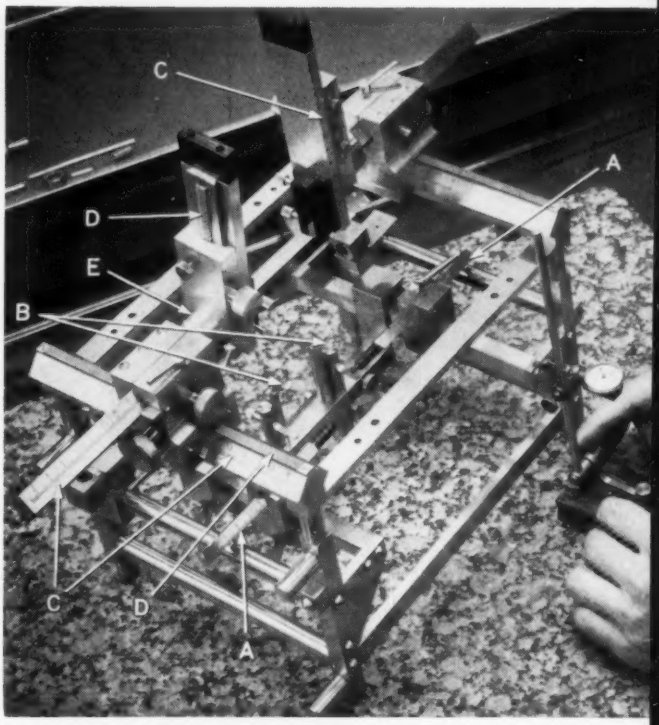
for penetrating single cells located on the spinal chord to one-half their thickness. These cells are five microns thick. Spindle *A* functions as probe and mounts the micro-pipette holder on its outboard end. Leadscrew *B* 1 mm pitch, drives an anti-backlash 100-t worm keyed to pinion shaft *D* which meshes with gear rack *E* for controlling extremely accurate vertical travel of pipette. Accuracy of vertical motion is indicated by vernier *C* graduated to 1/200 mm for fine adjustment and scale *D* graduated to 1/100 mm for course adjustment. Splitting the graduations of scale *C* will give a penetration of 1 micron to the pipette (1 micron = 0.0001 mm). Vertical dovetail slide rides on staggered ball-bearing ways and entire head can be swiveled 45° either side of center. Transverse motion of head is provided by pinion *F* meshing with gear rack on base of dovetail slide *G*; while longitudinal travel is acquired by a lead screw (not visible) which slides base over guide bars *H* graduated with rings in increments of 1 mm apart

GREATEST MACHINE EVER . . .



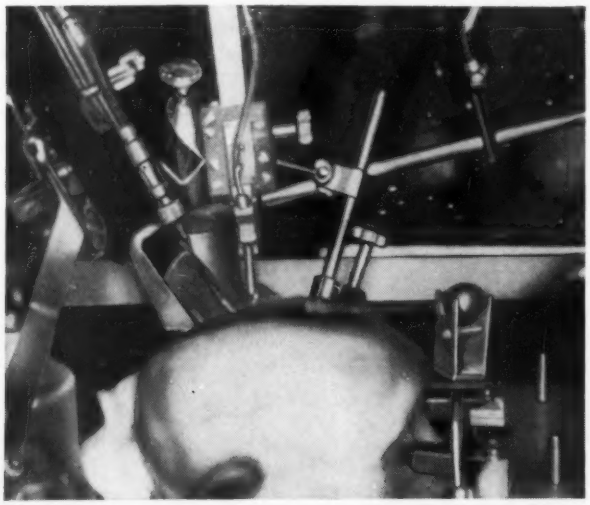
Micro-pipettes . . .

made from Pyrex-soft-lead glass are drawn down from a tube 2 mm in diameter with an ID of 0.1 micron. Tube is heated inside an induction coil; when glass is almost fluid it is drawn out until desired probe diameter is reached



Stereotoxis instrument . . .

used to immobilize animals while performing brain surgery for the study of mental diseases. Insulated ear arbors ***A*** and eye clamps ***B*** serve a double purpose—they position the animals head according to original compiled data for exact location, and also render the head immobile. This is a very important procedure for continued study of specific brain cells in the individual patient. Vernier scales on ear arbors and eye clamps measure animals' head, establishing reference points and reproducing original position in relationship to reference dimensions of micro-pipette electrodes and probes. Note vernier scales **C** and helical gear ***D*** on "V" ways for lateral adjustment, and on dovetail slides for perpendicular movement. Protractor scale ***E*** permits angular settings

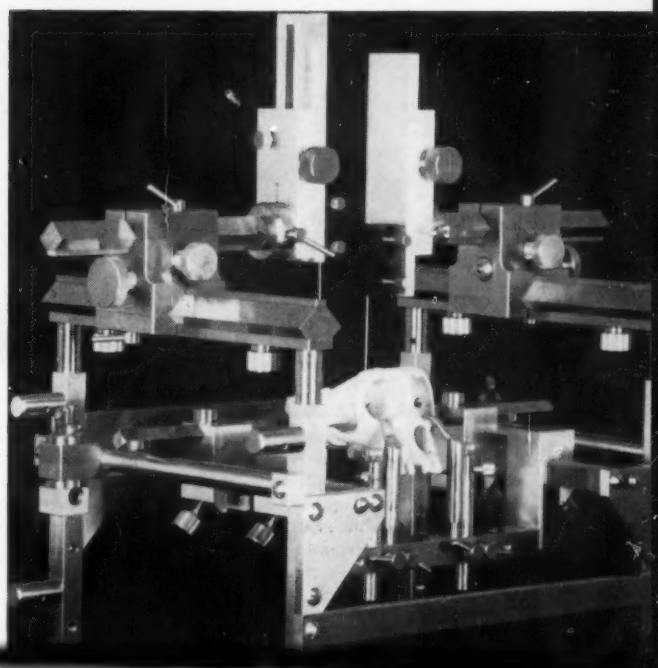


Here's an actual operation . . .

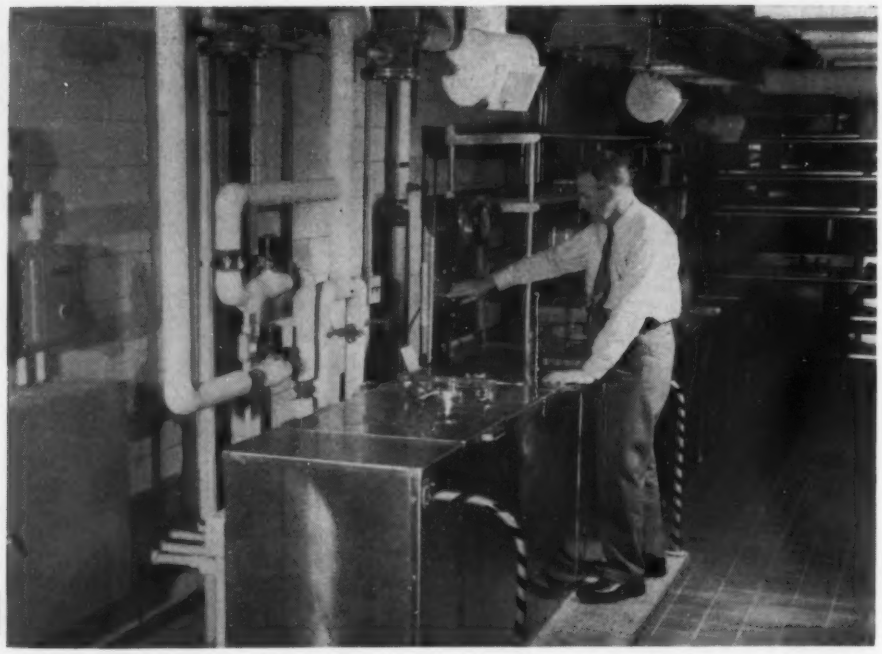
taking place on the cortex of a monkey's brain using the stereotoxic instrument and micro-electrode recording apparatus. Note second probe (left) on dovetail slide set to compound angle and eye clamps positioned on subject (lower right)

Skull of a subject . . .

here used for initial tool tryout, is repetitively located within stereotoxic instrument in the same exact position for subsequent operations. Instrument made from non-magnetic 303SS, was ground parallel and square to 0.001 in. TIR. Emphasis on squareness is very important because when in use, instrument is indexed in several planes, while readings are being compiled, and secondly to assure interchangeability of parts used for calibrating readings. Flexible design permits taking readings involving several planes from any position within the framework of instrument



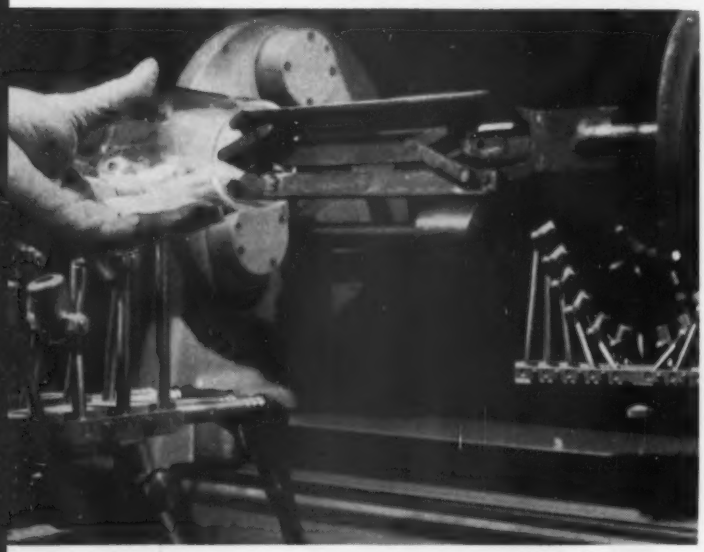
• PIPETTE WASHING TANK



Automatic washing machine . . .

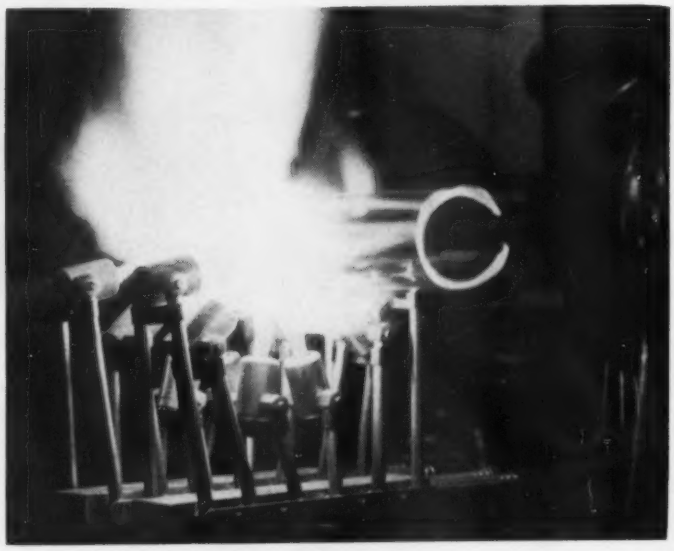
for micro-glass pipettes was entirely built from 316 stainless steel including the pumps and piping. This type of material was selected in order to prevent erosion of metals from high alkaline content of the detergent. Tests conducted with pumps having bronze housings and impellers were found to lose their head pressures after eight months of operation because of erosion. Machine will wash five sizes of pipettes in same container without sorting or soaking, and three men can turn out 5000 washed pipettes in a seven hour day. Each pipette is washed in a separate tube thereby eliminating breakage and etching of graduations. Automatic cycling includes a four minute wash with detergent pumped at 35 psi through container at 180 F, followed by a three-minute rinse with water at 140 F; a two-minute demineralized water rinse at 140 F, and finally a two-minute soft water rinse at 140 F

• FORMING GLASS ON LATHE . . .



Glass tube is mounted . . .

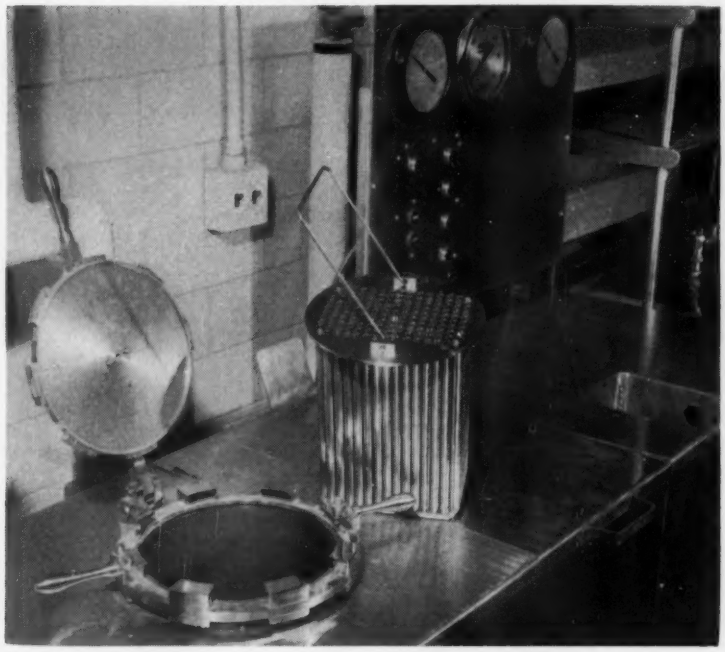
on expanding arbor to shape tube to a tissue culture flask. Need for developing special flasks was to obtain a glass surface optically clear to permit microscopic and photographic study. Shape of flask allows centrifuging without excessive loss of specimen cells. Conventional lathe with multiple gas burners and expanding arbor in headstock comprises entire setup



Glass tube is heated . . .

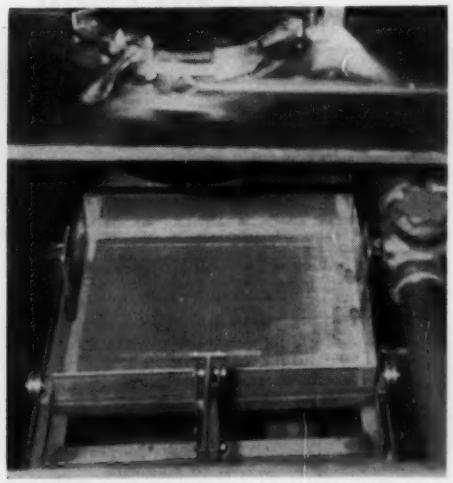
until it is fluid, then arbor is gradually expanded to full size. Burners mounted on lathe carriage reciprocate over entire length of tube for uniform distributiion of heat as tube revolves in headstock spindle

GREATEST MACHINE EVER . . .



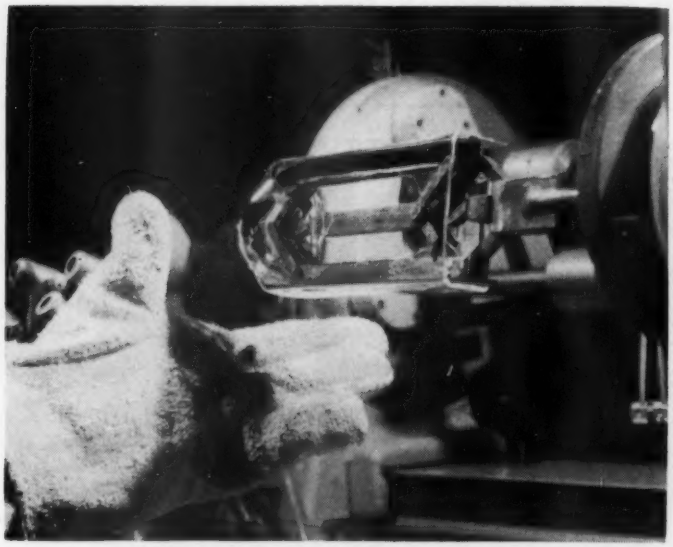
Pipette carrier . . .

has a plastic Kel-F gasket placed between the SS plate and tubes for protecting glassware against breakage and for providing a better seal. Plastic was chosen for its ability to withstand high temperature and resistance to abrasion



Main tank . . .

has two compartments—one for detergent wash and one for circulating rinse water. Both compartments have removable-overflow pipes to maintain constant liquid level and when removed allow drainage to sanitary sewer. Detergent fluid in first compartment is directed back to tank through screen which catches cotton plugs and other solid matter. Time relay in the cycle allows container to drain into wash tank thus preventing contamination to rinse water. At this point a two-position-control motor transmits motion to the carriage-on-rails mechanism which moves into second position for circulating water rinse. Control panel has a gauge which indicates pressure for each operation of cycle and also stoppage of strainers or lack of fluid. Entire top and front surfaces of tank assembles are insulated with glass wool one inch thick to protect operator from excessive heat



Rectangular section of flask . . .

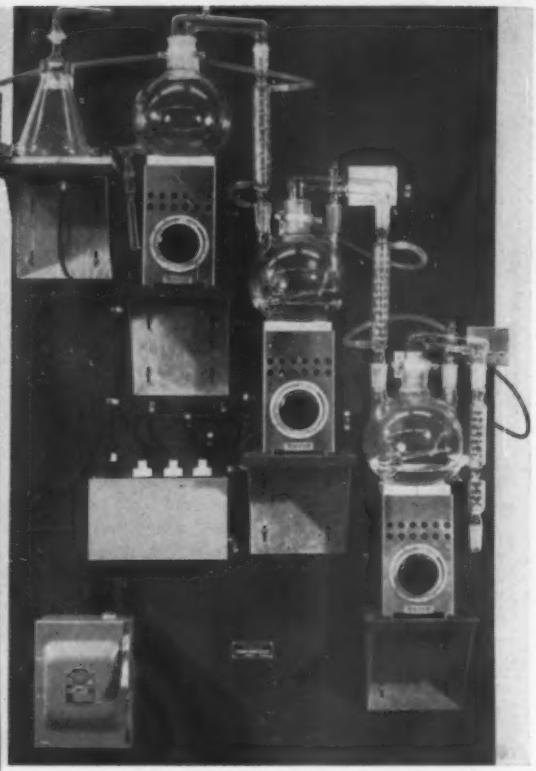
is formed in this operation. Next operation calls for forming throat

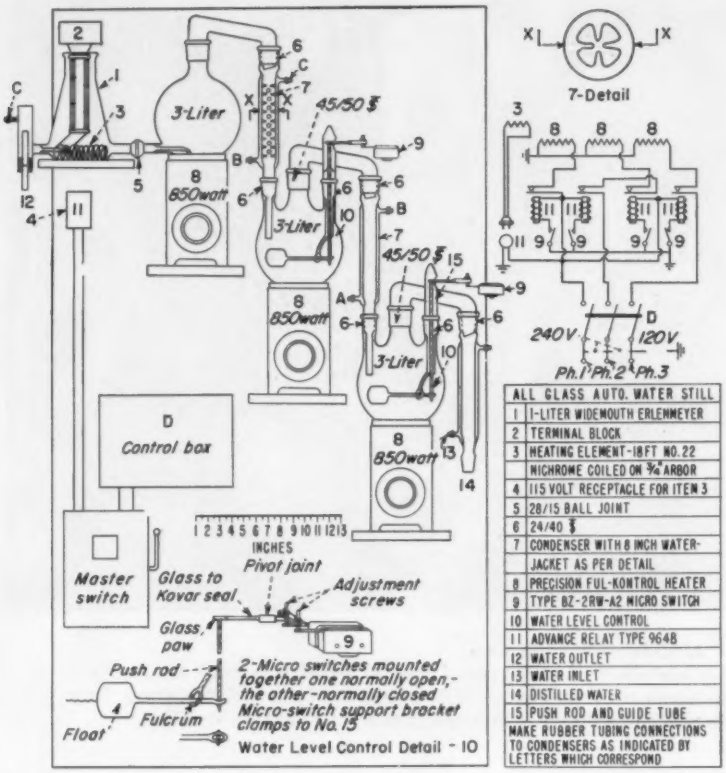
Glass blower . . .

heats rectangular open end of flask over gas burner, then draws fluid glass down to a hub equal to throat diameter. Next step requires fusing a secondary long throat to hub on flask, and while glass is still fluid, irons out wrinkles by blowing into small stem of secondary throat. Final step trims off auxillary stem and heads end of throat for stopper

TAILOR-MADE INSTRUMENTS FOR THE

• DISTILLATION...



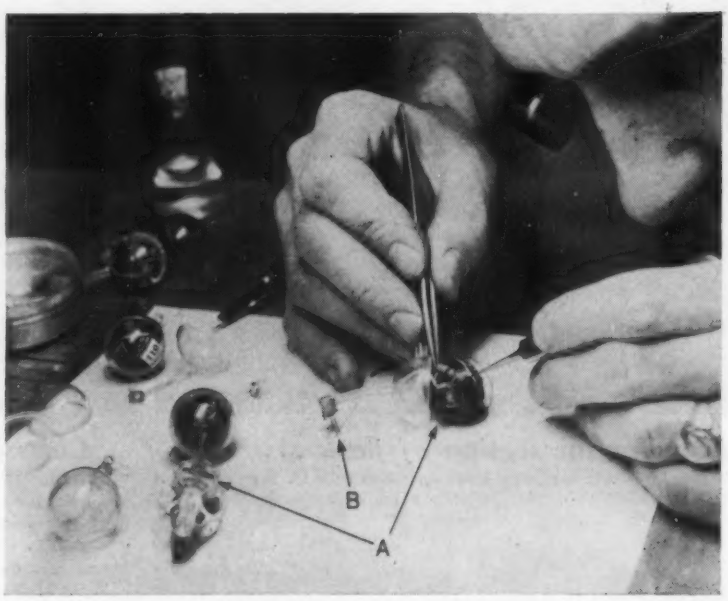


ALL GLASS AUTO. WATER STILL
1	1-LITER WIDEMOUTH ERLENMEYER
2	TERMINAL BLOCK
3	HEATING ELEMENT-18FT NO.22 NICHROME COILED ON 3/16" ARBOR
4	115 VOLT RECEPTACLE FOR ITEM 3
5	28/15 BALL JOINT
6	24/40
7	CONDENSER WITH 8 INCH WATER-JACKET AS PER DETAIL
8	PRECISION FUL-KONTROL HEATER
9	TYPE BZ-2RW-A2 MICRO SWITCH
10	WATER LEVEL CONTROL
11	ADVANCE RELAY TYPE 9648
12	WATER OUTLET
13	WATER INLET
14	DISTILLED WATER
15	PUSH ROD AND GUIDE TUBE
MAKE RUBBER TUBING CONNECTIONS TO CONDENSERS AS INDICATED BY LETTERS WHICH CORRESPOND	

All-glass automatic water-distillation apparatus...

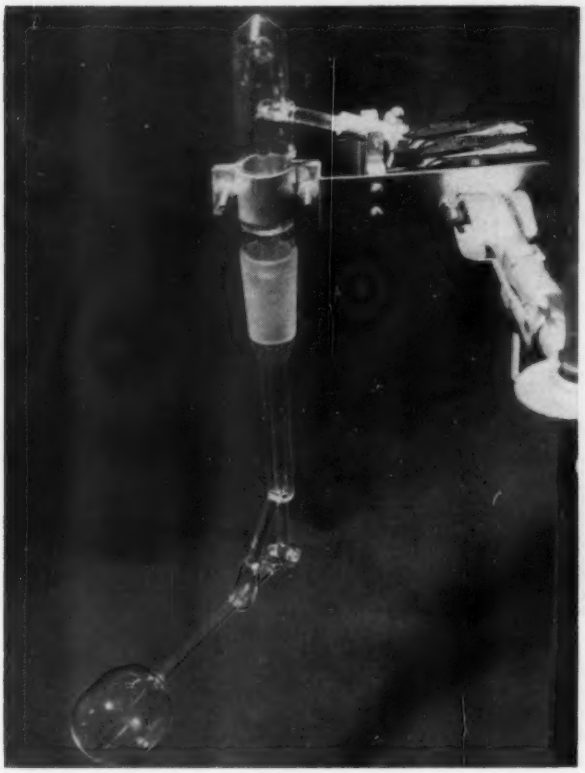
yields water sufficiently free of foreign electrolytes for the standardization of salt and buffer solutions; a requisite for chemical and biological analysis. Tap water is fed into the Erlenmeyer flask where it is preheated to allow escape of chlorine, CO_2, and other volatile gases. Then it passes via needle-like ejector into top round flask where it is distilled first time. Glass tube *12* controls fluid level in these two flasks. First distillate is redistilled in center flask and condensate collected in bottom flask. Final distillate is collected in a large Pyrex carboy. Average output at a constant rate equals 600 milliliters per hr. Modification of Erlenmeyer flask permits same operating efficiency in areas where water has a high mineral content

• REMOTE CONTROL OF BRAIN ...



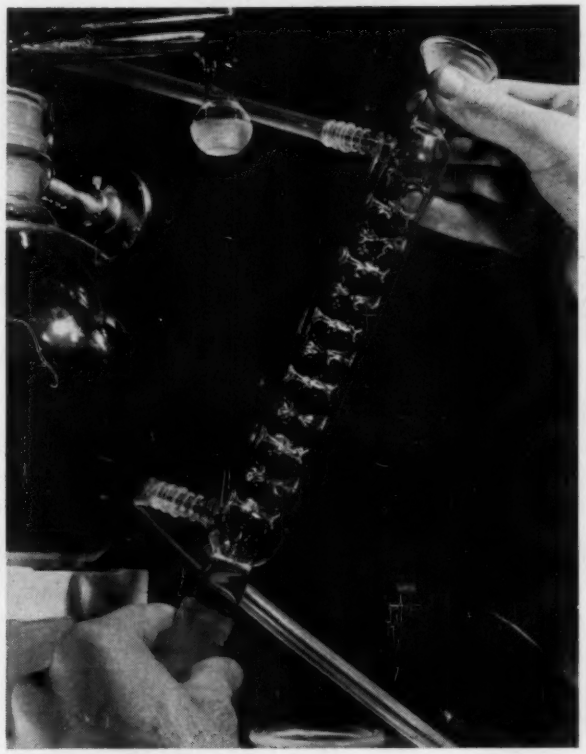
Electrical stimulation...

to the brain by remote control is made possible by a radio sender and a radio receiver. When location of defective cells of brain is pin-pointed a miniature radio receiver *A* is affixed to the skull with two platinum electrodes *B* penetrating the particular cells to a predetermined depth. Then by use of radio sender controlled impulses relayed to receiver will reactivate damaged portion of brain to normal use. Animal is free to move about and respond in a natural manner as no restraining wires or connections exist between radio sender and receiver



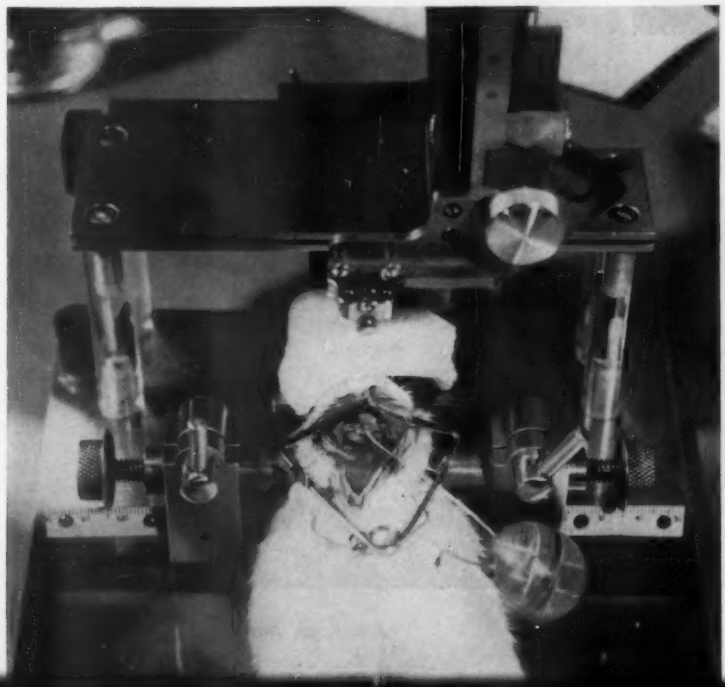
Water level . . .

in center and bottom flask is regulated by a pair of these free-moving floats which in turn activate a pair of relays. System is so designed that when water level of center flask is too low, its heater is cut off. When level is too high, heater element on top flask is cut off. Water level in bottom flask is controlled in like manner. Points of water level in flasks can be regulated by adjustment screws on microswitches



Vigreau-type condenser . . .

designed and built by the glass-blowing dept because of need for high operating efficiency within a confined space. Condenser above has same efficiency as other condensers three times larger. Major equipment includes four glass-blowing lathes, 36-cu ft annealing furnace, lapping machines for cylindrical and flat surfaces, lining and numbering machine for graduated glassware and high-vacuum system for evacuating and gasing of special glassware

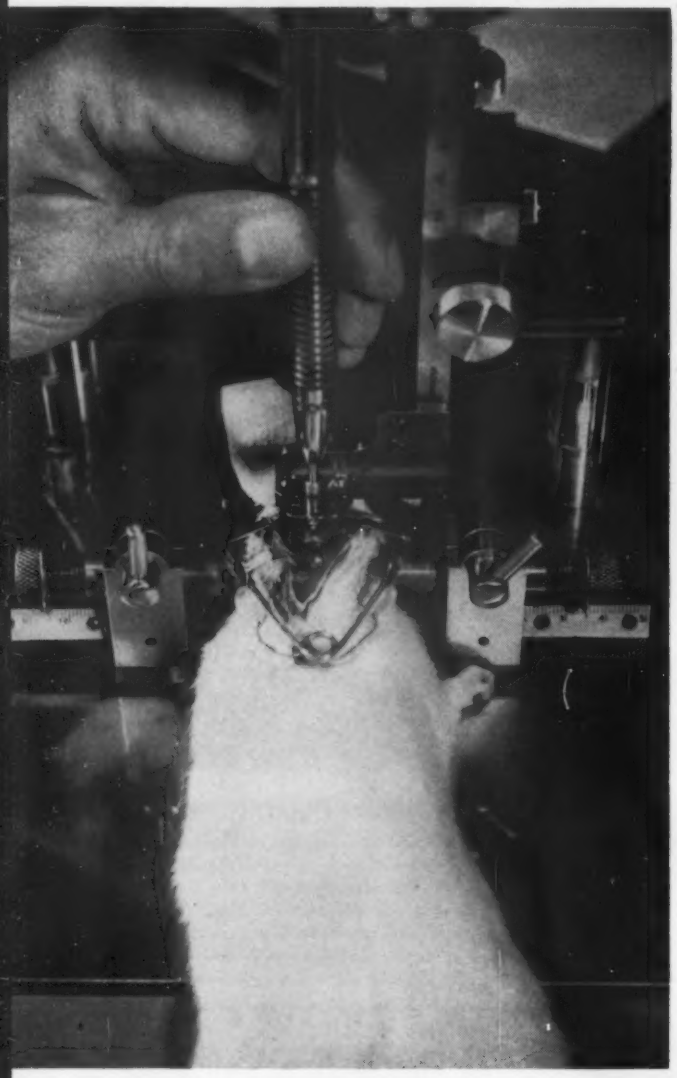


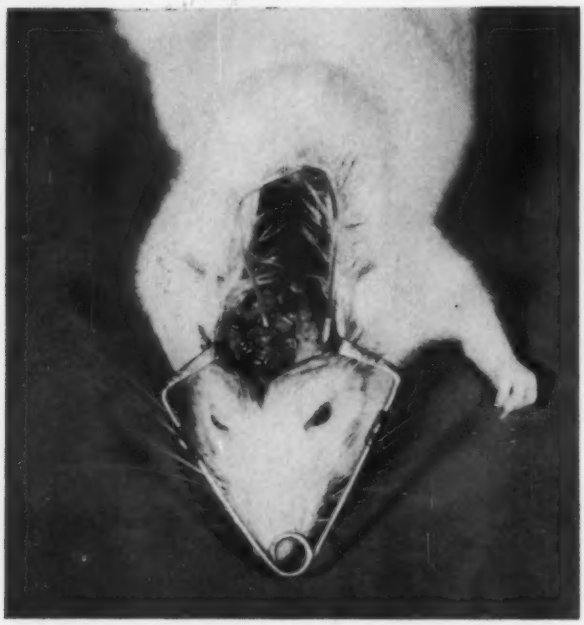
Electrodes are held securely to skull . . .

by a silver plate and two sterling-silver screws. Drill jig above is used for drilling and tapping holes in skull for screws, and hole locations are determined using ears and eyes as reference points. Protective conical plugs are slipped into the ears and the plugs in turn receive centering screws from the two arbors. There is no sense of pain or sensation to humans or animals when the skull is drilled, tapped, or sawed

TAILOR-MADE INSTRUMENTS FOR THE

• REMOTE CONTROL OF BRAIN ... continued





Radio receiver ...

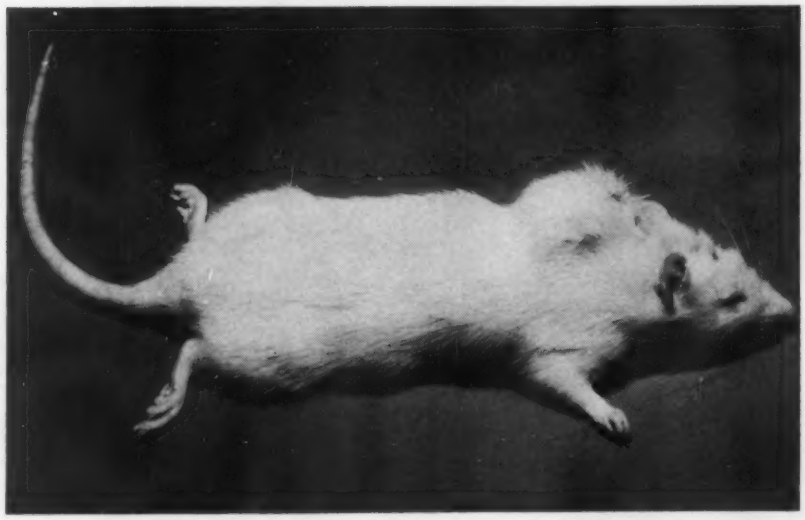
attached to skull and partially enclosed in rat's body. All the materials used in receiving unit are non-toxic to living tissue, therefore, can be left in body for indefinite periods of time. Tubing is polyetheline, and spherical shell is lucite

Drill jig ...

is mounted on dovetail slides to provide travel in lateral, transverse and vertical positions. Locks secure slides during drilling and tapping operations to maintain precise location. Centering pointer picks up exact location and is then replaced by a dental handpiece (shown in photo) which has a specially constructed spiral drill. Stop on drill shank controls depth so as not to enter brain tissue. Holes are then tapped with No. 00-90 threads. Drill jig was designed to give maximum visibility and flexibility for investigator to experiment, X-ray, and administer anesthesia.

Receiver completely enclosed ...

in body of rat. Coil in receiver is a non-directional simple RF tuned circuit. Radiated frequency from sender is picked up and recorded on an oscilloscope for controlling strength of impulses. By this technique, damaged areas of brain which are inactive can be made to respond normally. By sending different frequencies, animal can be made to eat, sleep, walk forwards or backwards, stand on hind legs, etc, which otherwise he would have been incapable of performing because the brain cells which control these actions are damaged



• PHOTOMICROGRAPHIC RESEARCH OF LIVING CANCER . . .

More than 15 years ago an attempt was made at the National Cancer Institute to study the action of the carcinogen (cancer producing substance) 20-methylcholanthrene (specific drug or chemical) on a strain of subcutaneous (living) fibroblasts (supporting tissues of body) taken from a young adult mouse and grown in an entirely heterologous (study made outside and away from original source) culture medium.

This research initially planned as a simple, short project became increasingly complex and gradually spun out into a major program of study extending over 10 years and involving many thousands of cultures and animal injections.

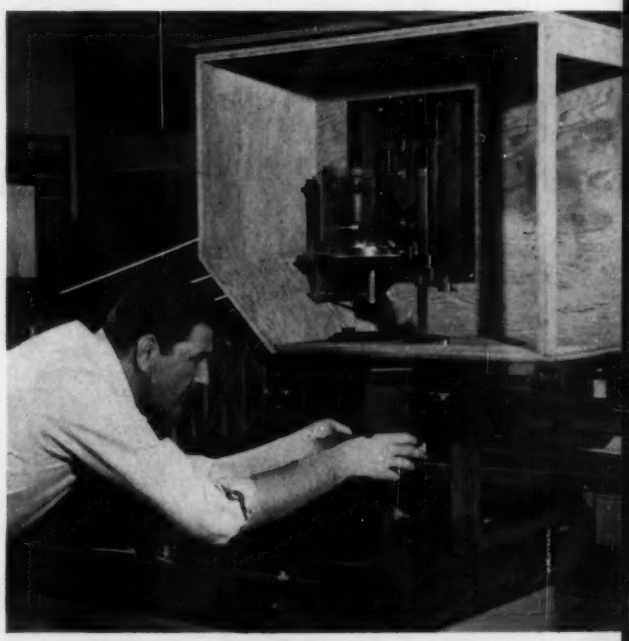
It was this study that deeply involved us in long-term, large-scale culture work. In this study, although the case and mechanism of transformation are even yet unknown, we did succeed in transforming the normal cells to cells capable of giving rise to sarcoma (tumor of connecting tissue group) when reinjected into animals of the same strain as that from which they arose.

As the study progressed it was found necessary to make numerous changes in its plan and these changes were all too frequently necessitated by limitations in the scope and accuracy of tissue culture methods available.

Initially an attempt was made to evaluate in detail the materials and equipment which had been used. The conclusion was reached that for the effective analysis of such complex variables as had been encountered a substantial increase in accuracy and facility of available long-term tissue-culture methods was imperative. Since that time, a substantial part of the effort of our laboratory has been directed toward improving tissue-culture methods and in developing the *long-term culture so that it would be of greater accuracy in cancer research and in related fields.*

One of the phases of the carcinogenesis (cancer producing) research depended on study of changes in cell and culture morphology (science of structure) over a period of years. Written descriptions were soon found to be entirely inadequate. Ultimately, a special camera was reconstructed by which a series of about 125 cultures per day could be recorded.

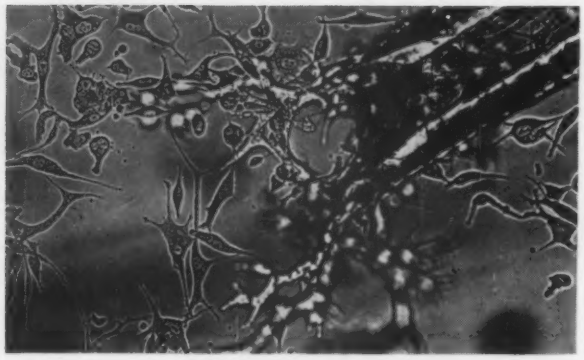
Photomicrographic equipment . . . was developed for long-term culture so that it would be of greater accuracy in cancer research and in related fields. A representative culture area 1x1¼ mm is routinely photographed at a magnification adequate to obtain general cell, nuclear and colony design at 200X. This necessitates use of standard-size film up to 8x10 in. of medium speed, reasonable grain, and high contrast. Emphasis is laid on unique value of this large-size film in its ability to record an area of culture sufficiently large to be representative and at a magnification giving adequate resolution and magnification. To obtain a wide range of magnification, it is essential that the camera have a bellows of at least 48 in. Inverted microscope was altered with an inverted stage bolted to the saddle and mounted so the flat stage surface on which the object, under examination, would rest at same level on frame as it had been originally. The base is made from reinforced concrete because of its cheapness, ease of handling, rigidity and vibration-absorption properties. Incubator housing is built from ¾-in. plywood, with double glass windows in front. Temperature inside housing is held between 38 and 38.5 C and heat is furnished by two 200w bulbs covered with aluminum foil, and wired in pairs in parallel series. Thermo-regulators are of the enclosed mercury-in-glass type because experience showed they can be relied upon to hold their setting over a number of years. An incandescent filament lamp was used for illuminating system because of relatively low magnification and intensity can be easily controlled by a variable transformer of Variac type in circuit with lamp. At extreme magnification lamp is supplemented with one of enclosed-arc type. Bed for the camera consists of 54-in. length, 10-in. swing lathe, minus tail and headstock



NOW ORIGINAL CAMERA HAS BEEN REDESIGNED for simplification and greater accuracy. Remodeling calls for installation of new camera, selsyn motor drive and new incubator with double-wall lucite front construction

TAILOR-MADE INSTRUMENTS FOR THE

• PHOTOMICROGRAPHIC RESEARCH OF LIVING CANCER ... continued

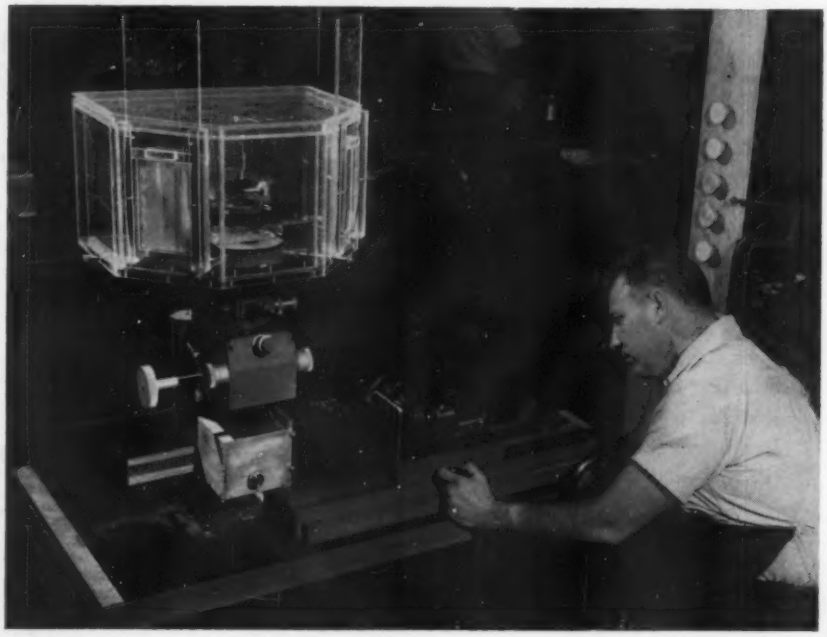


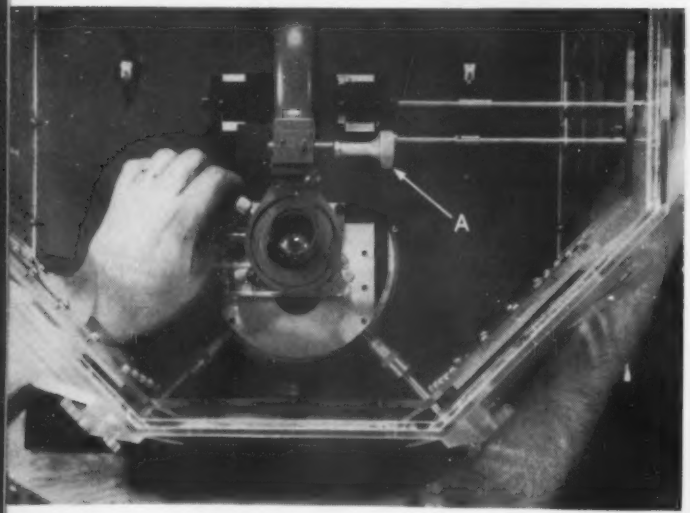
Excellent picture ...

taken with this photomicrographic camera which shows for the first time the successful proliferation in tissue culture. Depicted is a pure clone strain of animal-tissue cells from a single cell. (Clone—a colony of cells which originated from a single cell). Note variation in cell size and shape, magnified 200X

Motion picture microcinematography camera ...

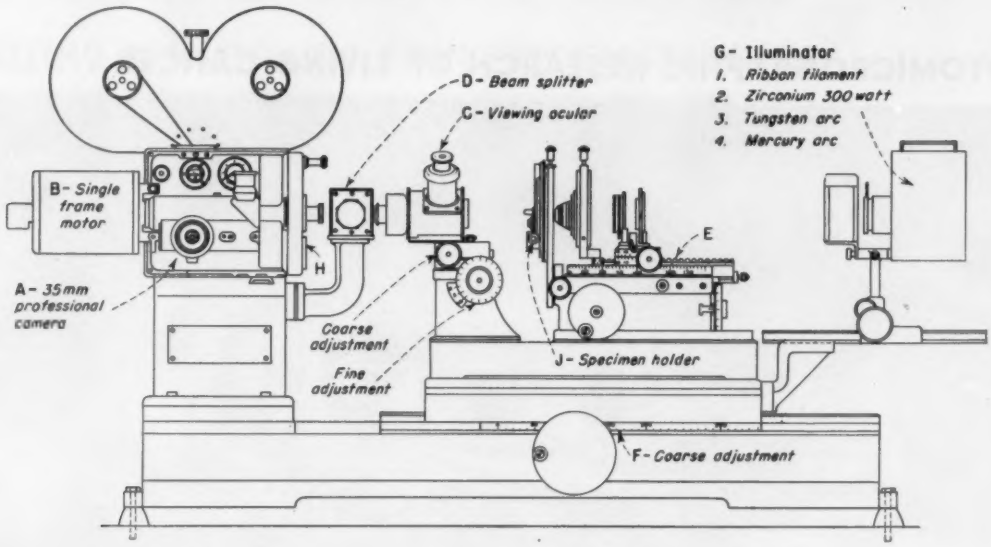
used to study the culture of living cancerous tissue during growth. Development of growth is recorded at time intervals on 35-mm motion-picture film. Camera unit is operated electronically and can be set to take one frame every 3 sec and on up to one every 360 sec. Bellows acts as a light trap and camera has been modified to allow observation of subject through a viewer mounted at a 45° angle to vertical projection plane. Main body of a Vickers microscope is used for viewing specimen and has been equipped with a coarse adjustment screw for rapid travel and a micrometer screw for fine adjustment and high magnification. This entire assembly is counterbalanced for sensitive, sharp focusing. Lower box ahead of bellows, contains aluminum-surfaced mirror, and reticle above microscope was made from pyrex glass ground and lapped flat to ¼ wave-length of light. Carrier for movie camera was made from a Meehanite casting





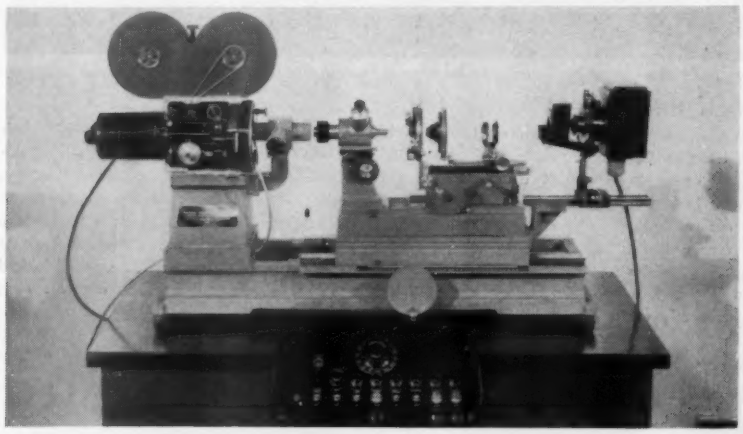
Looking into top of incubator chamber ...

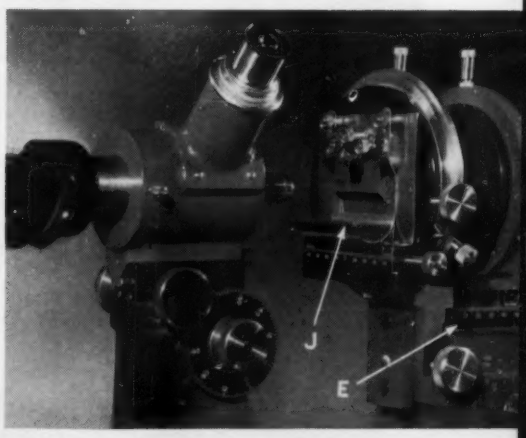
with culture positioned on adjustable rotary table. Temperature inside incubator chamber can be controlled to 1/10 C. Base of chamber is a heavy aluminum plate to which three heating elements are attached and controlled by individual thermoregulators. Other partitions of enclosure are made from two layers of Plexiglas to minimize heat losses. Two sliding panels backed up by a double layer of over-lapped pure rubber permits insertion of operator's hands for loading incubator. Fine and coarse pitch screws on extreme right-hand side are used for control of rotary table indexing. Two micrometers mounted in front of incubator are for adjustment of axial positioning of rotary table. Pinion *A* meshes with gear rack on dovetail slide for controlling rise and fall of light source to focus on specimen. Highly concentrated zirconium arc furnishes 300 watts for brilliant illumination. Entire unit is mounted on a heavy cast-iron ribbed casting with three pads secured to vibration dampeners



Split-beam prism . . .

provides double receiving to a standard Bell & Howel camera *A* equipped with an animation shutter for shooting periodic frames every 3 sec or for other time durations up to 360 sec per frame. Film strip identifies the specimen by serial number and notes hour of day of each frame. Entire face of a Hamilton watch, especially adapted to instrument's optical system, appears in upper right-hand corner of every frame on film strip. Low and high magnification is provided by a Bausch & Lomb microscope equipped with a full range of condensers and a light source supplied by a tungsten arc. Light-sensitive cell hooked up to a galvanometer measures the intensity of light source. Richardson frame motor *B* is electronically controlled to permit single frames. No lens was used in the camera proper. Microscope lens is used for projection having a full range from low to high magnification and viewing ocular *C* is for bringing object into focus. Beam splitter *D* between camera and microscope enables operator to observe during photography. Scale *E* allows condenser lens to be adjusted according to their values while scale *F* provides a reference for various objections desired. Intensity of ribbon filament lamp *G* is controlled by installing photo cell in camera turret *H*. Live specimen under observation is placed in metal holder *J* which has a slot to allow skin flap of specimen to be positoned in field of observation (see closeup below)





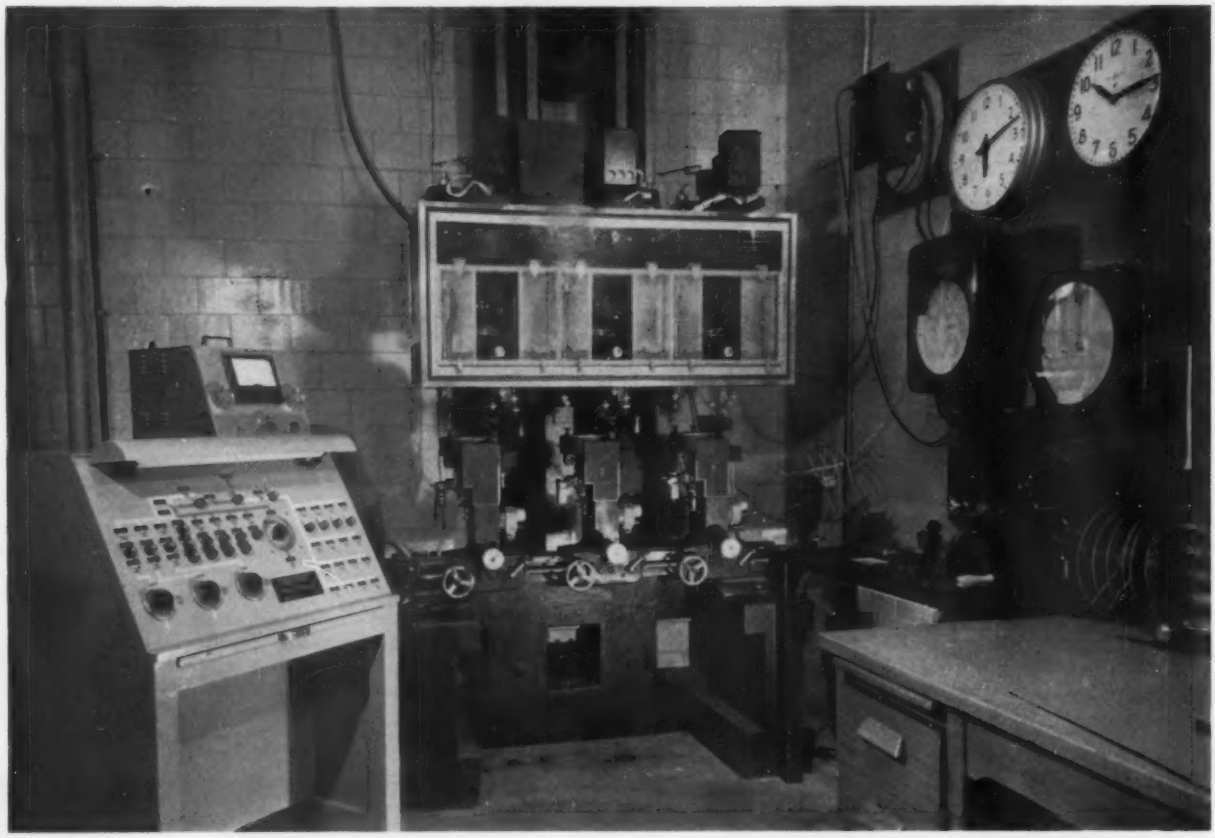
Using time-lapse techniques . . .

of the Cine photomicrographic camera for homologous study (within body structure) makes it possible to accelerate very slow events such as cell division or to slow down rapid events such as blood flow. Data acquired by this method provides direct information on various problems of cancer, such as growth of cancer cells, and blood supply invasion of normal tissues, and damaging action of various physical and chemical agents

Transparent chamber . . .

placed in fold of skin of a mouse allows observation with a microscope of blood vessels and of cells in living animal. Many movements of cells and of intracellular structures when seen with the optical microscope are so slow they pass unnoticed. Reactions of blood vessels or of cells flowing in the circulatory system frequently are so rapid as to escape detection. To solve this two-fold problem, the scientists and instrument men at the Institutes developed the Cinephotomicrographic camera as an important tool in transparent chamber studies

• PHOTOMICROGRAPHIC RESEARCH OF LIVING CANCER ... continued



Triple microcinematographic equipment...

was developed to study cell cleavage and migration as well as the behavior of normal cells as a control. The instrument handles 35-mm film with exposure-frequency range from one frame per sec to one frame each 2 min. To maintain temperature control, inverted-fixed microscopes are enclosed in a constant-temperature bath. Heater, thermostat and air circulator are essential to insure uniform temperature over an extended interval, and a thermograph provides a written record of temperature during interval of any one film. Three parallel vertical lathes supports the microscope assembly for adjustment to a variable height while the cameras are carried below them on a horizontal lathe bed. Range of magnification runs from 20X up to that reached with oil-immersion lenses. The substage must therefore handle both low and high power condensers. Observation ocular beam splitter is used between microscope and camera to insure correct centering and focusing of image and to keep it under observation while apparatus is running. This unit is locked on the camera. Much of the work under observation involves runs of 12 hr or longer

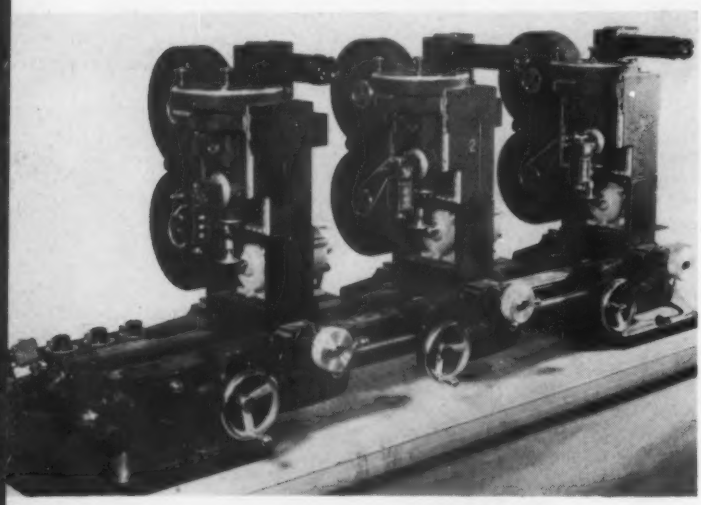


Image in the field...

is held to film without interruption by synchronizing the camera to the leadscrews of its lathe. Each revolution of shutter moves the camera a predetermined lateral or transverse distance, but is controlled electronically so that no movement can take place while shutter is in motion. The object being to follow the cell. Cultures under investigation are almost photosensitive, which requires the light on them to be as short a duration as possible. Therefore exposure is controlled by the time of light rather than when camera shutter is open. Special gearing on rear of lathe is hooked up to leadscrew, providing lateral travel of carriage to 0.004 in. only while shutter of camera is closed. The bevel gears are connected to Selsyn motor and directly into camera for advancing film and controlling shutter. Note in lower left hand corner electrically operated air cylinder for transmitting motion to carriage through leadscrew

• PLOTTING REACTION OF UNKNOWN SUBSTANCES . . .

Housing for spectrograph . . .

is a one-piece C1 casting. Modified driving components *A* incorporate a servo system and cams having varying coordinates which in turn are geared to the recording drum. Differential gears are used to change timing output by furnishing three speeds to recording drum. A clutch disengages gearing for free-wheeling of drum during set-up periods. Light source is supplied by a globar and a ceramic filament lamp. Water-cooled motor drive interrupts the light beam at 1800 intervals per min. Salt prism is contained within the main housing which has been evacuated of air and filled with nitrogen under negative pressure. Two substances are introduced into the instrument — one known, the other unknown — then their reaction is recorded on the graph for plotting and comparison

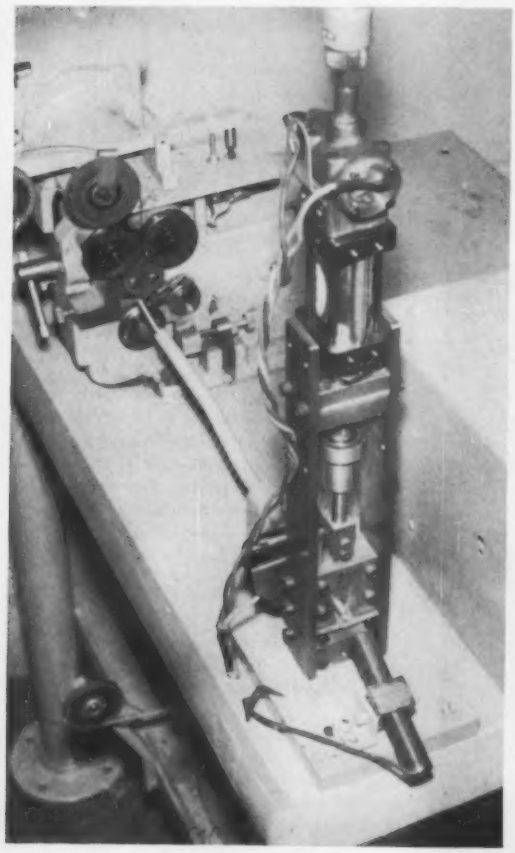
Infrared spectrograph . . .

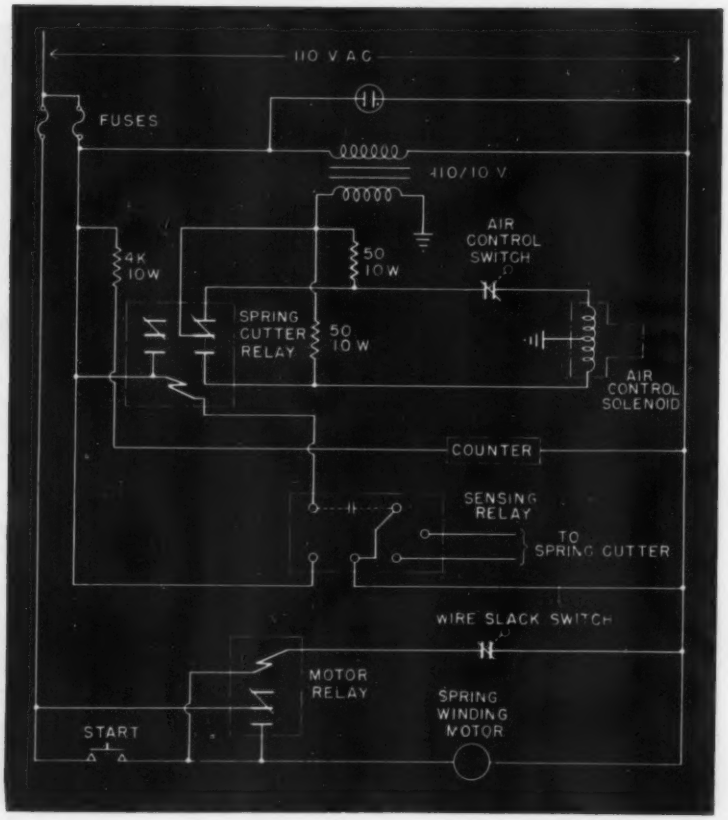
for recording at high resolution in the region of three μ (microns). This instrument differs from commercial models in being a grating for primary dispersion. This setup has the distinct advantage of offering higher dispersion and resolving power for the study of hydrogen bonding. A prism in Wadsworth mounting serves for preliminary dispersion to reduce background and remove other orders. Cams synchronize two monochromators and furnish constant frequency or constant wavelength scales. Recording drum is integral with cams thus avoiding lash errors. Servo systems developed in the laboratory control slit width, recording speed, time constant, and gain and limit the error signal. Cam *A* governs time interval on drum, while three lower cams *B* control rotation of prisms, mirrors, and opening and closing of slits. Instrument maker is assembling box for detector for receiving radiant energy and thermocouple for measuring the range of radiant energy

• SPECIALLY DESIGNED PROJECTS ...

Automatic spring-winding and cutoff machine ...

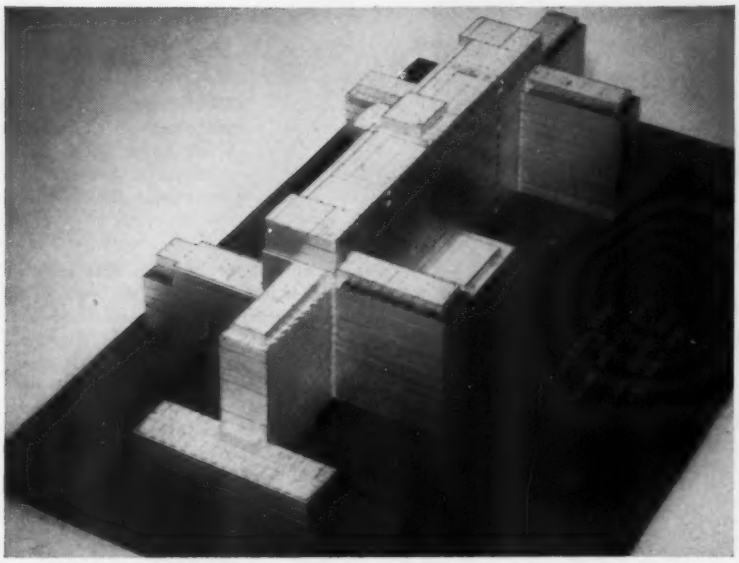
Setup includes a standard hand-operated spring-winding unit which is adapted to an electric motor and gear-reduction drive. Wire from a coil feeds over a pulley on a pivot arm which trips a precision miniature switch when excessive tension is exerted on pulley due to fouling. Continuous wound spring feeds from unit through a guide tube to a double-action air cylinder which cuts off springs to any desired length. As spring passes between "guillotine type" cutter it enters a tube which contains an adjustable low-amperage contact stop set to a predetermined length. When spring contacts the stop, circuit is closed, permitting full voltage to air cylinder which trips upper cutter and cuts off spring. At bottom of cutter stroke a second precision miniature switch is tripped returning cutter to starting position





Electrical schematic ...

showing complete circuit of automatic spring winding and cutoff machine



Three-dimensional scale layout . . .

1/32 in. to ft of Institutes building machined from 2S aluminum sheet. Blank aluminum sheets were photographically etched from layout of floor plan, then machined to layout lines. Etching process used series of colors for layout lines to designate various research divisions and white areas for patients. Additional etched color code was also used to indicate types of activities carried out on a floor-to-floor basis. Complete layout was doweled together, including three subbasements. Entire scheme of layout proved practical and flexible, yet cost only a fraction of other forms of three-dimensional layouts. Seven research divisions of National Institutes are Cancer, Heart, Arthritis & Metabolic Diseases, Dental Research, Mental Health, Neurological Diseases & Blindness, and Microbiological

• TAILORS IN ACTION . . .

Here tool and instrument makers . . .

are at work on their own projects. Main section of machine shop includes toolroom-lathe line with nine Cincinnati's from 10- to 18-in. swing, three Hardinges, and seven South Bends. Other equipment listed

NO.		MACHINE TOOLS
1	—	Pratt & Whitney bench miller
2	—	Hardinge millers
1	—	Bridgeport
2	—	Brown & Sharpe universal millers
1	—	Van Norman miller
1	—	Linley jig borer
1	—	Gorton pantograph
1	—	Norton surface grinder
1	—	Delta carbide grinder
1	—	Brown & Sharpe tool grinder
1	—	Dumore toolpost grinder
2	—	Do-All bandsaws

NO.		MACHINE TOOLS
1	—	Horizontal Johnson band cut off saw

TESTING AND MEASURING EQUIPMENT

Optical flats
Gage blocks
Sine bars
Microscopes
Dynanometers
Stroboscopes
Tachometer
Liquid air flow meter standards
Pressure-measuring instruments

TAILOR-MADE INSTRUMENTS FOR THE GREATEST MACHINE EVER . . .

• TAILORS IN ACTION . . . continued

Jig-mill . . .

equipped with infinitely variable speeds and feeds was specially designed and built for the Institute. A versatile machine was needed to handle a large capacity of work ranging from simple to complex in all sizes and shapes. On this machine milling operations have been performed with up to 6-in.-dia face cutters and jig-boring operations calling for tolerance of ± 0.0001 in. Note the deep throat, "V" ways for end measuring rods, over-all heavy-duty construction and exceptional spindle-head travel

Electronic engineers at work . . .

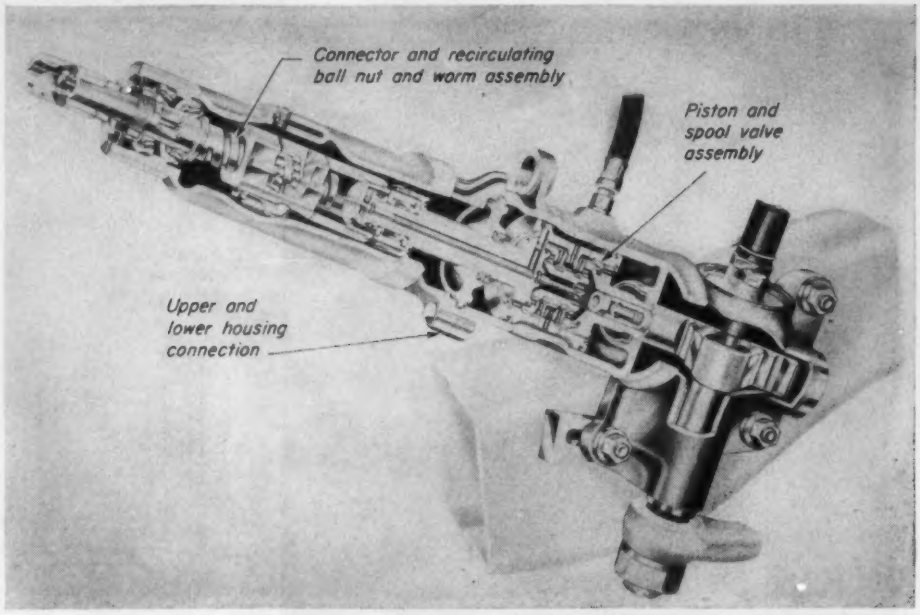
in their laboratory, used for development of electronic and electro-mechanical components as well as modification and maintenance of specialized laboratory equipment. This laboratory was established in 1949 when the need for more sensitive detection and control on medical and biological instruments became apparent. Engineer at left is checking tubes used in droplet counter. Man in center is measuring leakage of high-voltage condenser used in closed-circuit TV receiver which televises close-ups of activities in operating room. Man in foreground is trouble shooting a scaler used for measuring the quantity of radiation energy. Master panel is isolated from power piped into Institutes to insure controlled voltage throughout system. Specially designed equipment built by these engineers included high-voltage power supplies, RF signal generators, droplet counter, and cathode-ray follower

SPECIAL TEST INSTRUMENTS IN ELECTRONIC LABORATORY

Oscilloscope—single and dual beam
Precision tube tester
Brush recording instruments
Signal generator
Audio oscillators
Photomultiplier microphotometer
Aneotherm
Sprague Analyzer

Well-equiped shop . . .

for electric, acetylene, and plastic welding also contains complete facilities for heat treating, carbide grinding, buffing, electroplating, honing, paint spraying, and precision metal rolling. Three forced-air ducts exhaust fumes


Connector and recirculating ball nut and worm assembly
Piston and spool valve assembly
Upper and lower housing connection

PRECISION FITS REQUIRE TIGHT TOLERANCES in small parts. Ground worm thread, for example, has end-to-end lead tolerance of 0.0001 in., contains 30 ball bearings for free movement in operation. Having no springs, the unit is completely hydraulic and depends entirely upon accurate functioning of its components. When filled with hydraulic fluid, (SAE 10-W motor oil) a maximum of 7½ ft-lb of turning effort is required to move the front wheels of a parked car

Small parts for power steering precision built in production

Pistons, valves, cylinders and other components of "coaxial" units held to 'tenth' tolerances in production. In an interview with William Humen, general foreman at Chrysler's Trenton, Mich, plant, we learned how they do it. Here are pictures of some more-interesting setups

Power steering units are made at Chrysler Corporation's Trenton, Mich, plant at a rate exceeding 100 per hour with new machine tools and special equipment. Certain small moving parts must be held within tolerances as close as 0.0002 in., necessitating extremely accurate production setups and, in some cases, selective fitting in assembly.

Heart of the power steering unit is a double-acting piston controlled by a spool valve within the piston body. Total piston travel is about 2 in. within its housing, while valve travel is only 0.008 in. for directing the flow of hydraulic fluid at high pressure through a system of passages. Close tolerances are essential in these components for proper functioning of the assembly. For example, the valve body is made up of four rings and a spacer, the assembled ID being finish ground and honed within 0.003 in. Individual rings and spacers are flat and parallel within 0.0002 in.

A connector and recirculating ball-nut and worm assembly is another major part. To eliminate play between worm gears and connectors, these parts are sorted into four assembly tolerance groups and color-coded. Variation between parts in a single group cannot exceed 0.0005 in. Assemblers, (in a special room where air is filtered and kept slightly above atmospheric pressure to exclude dust or dirt) select worm gears and connectors having the same color code so parts are perfectly matched to reduce end play to a minimum.

Cast aluminum upper and lower housings are machined to precision tolerances too, and must be sound and absolutely leakproof. Special machines are employed for the operations, which include boring, facing, turning and broaching. Faces where upper and lower housings are joined must be flat within 0.0005 in., and the bore of the lower housing is honed to a finish of 15 mu in. rms. Castings are tested for leak resistance under pressure in a water bath, and all housings are cleaned scrupulously before they enter the final assembly room.

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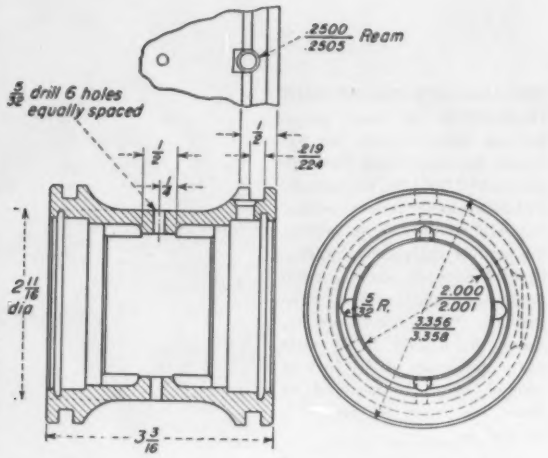
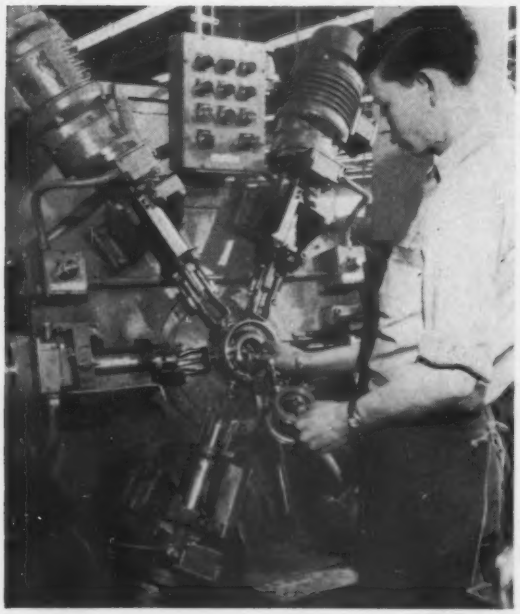
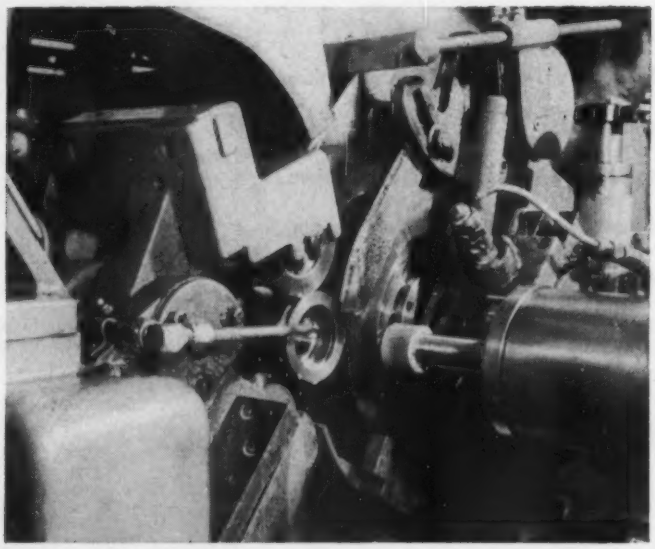


DOUBLE FIXTURES and a special automatic six-station Turner machine drills, countersinks, reams and mills a slot in malleable-iron pistons. Parts are turned, faced, bored, grooved, and ground before loading them into this machine on expanding collets that clamp by means of air-operated acme screws. Six fixtures each contain two positions, work is completely cycled in the first, then turned end-for-end and run through again in the second position. First station is load and unload, second has two 4-spindle LeMaire heads which produce four 5/32-in. radius port holes in the bore wall of two parts by engaging one-half the diameter of 5/16-in. drills. Third station is similar and flat-bottom drills the same holes, while a right-angle milling head at the fourth station produces a slot on one end of the piston. A 15/64-in.-dia hole is drilled through this slot, countersunk in the fifth station and reamed to 0.2500-0.2505 in. in the sixth. Second cycle is similar except that only port drilling is required. One piece is completed every 28 sec



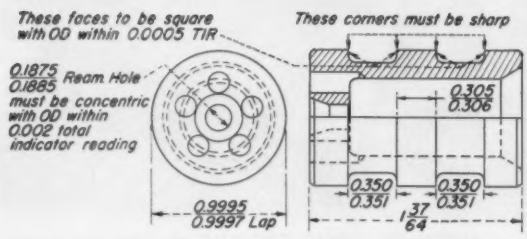
ANOTHER SPECIAL DRILLING SETUP is this vertical Turner machine where six equally spaced 5/32-in.-dia oil-return holes are produced in the piston body. Work is loaded and mechanically clamped in a central chuck, being located on a key engaged in the slot previously milled, after which all six drills, guided by special bushings, simultaneously advance. At 100% efficiency, about 240 pieces per hour can be completed here



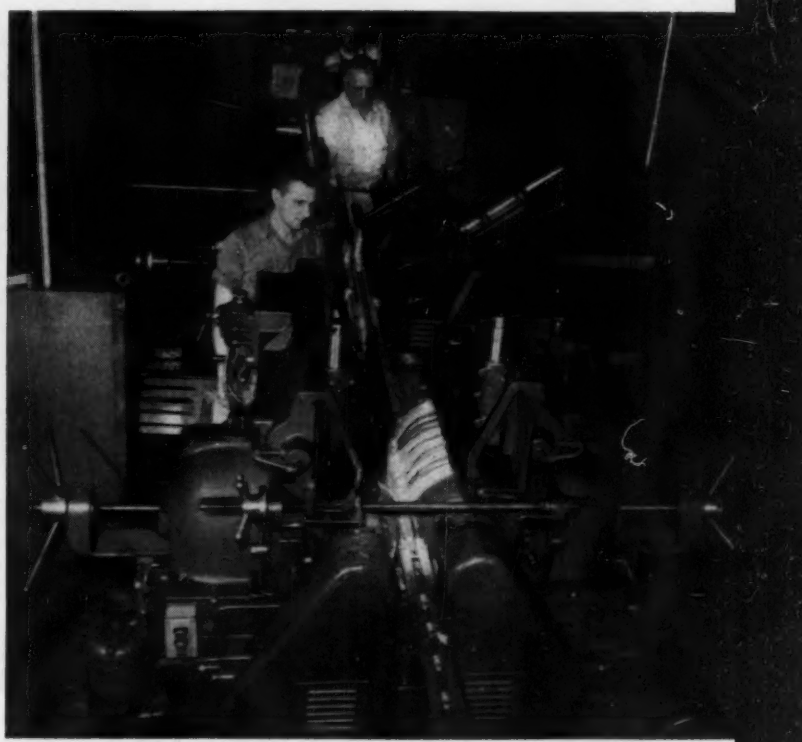
AUTOMATIC LOADING for internal grinding piston bores is accomplished in this Heald machine by means of a magazine that feeds work to three rolls. Ejection is automatic, too, over the large roll that carries the piston to a chute in the rear of the machine. Rolls also control size and finish by their position, which is preset within required tolerance. Bore is held to 2.000-2.001-in. dia, and a 30 mu in. rms finish is required. About 0.010 to 0.012 in. of stock is removed from the diameter in this operation, performed at about 101 pieces per hour

GROUND AND LAPPED valve rings and spacers on an arbor are installed in pistons with a 0.0035-in. interference fit. This is achieved by heating the pistons to 500F, then cooling the assembly in oil while pressing the rings in place on this American Broach press. Rings must be flush with the ends of the pistons within 0.005 in. after being installed, when the arbor is removed. One operator handles two setups—is aided by a conveyor which carries hot pistons from an adjacent furnace

HONING PISTON BORES WITHIN 0.0003-in. total tolerance is speeded by an automatic, double-end fixture on this Micromatic unit. Freedom of movement for perfect balance of the work during the operation is achieved by pivot pins that engage the piston slightly above the radial center. Assembled with the rings and spacers, piston bores are ground square within 0.001 in. prior to honing which produces a finish of 10 mu in. rms. One operator handles two setups and checks each ring in the bore individually in a Sheffield Precisionaire gage with a carbide spindle



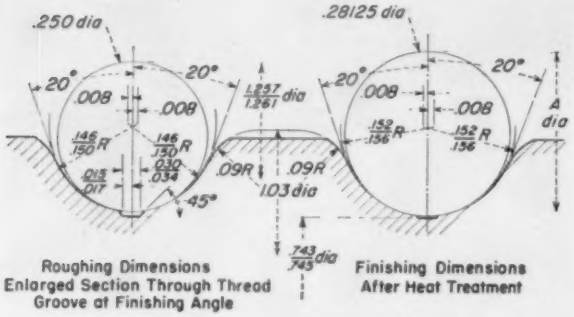
CARBIDE CRUSHERS control wheel size in this plunge-grinding operation where valve grooves are produced to close tolerances in a Sheffield machine. Wheels can be crush formed 60 times before crusher rolls are replaced. Work is held between centers and is loaded by means of a special fixture that pivots it into position. Continuous automatic feed removes 0.010 to 0.016 in. of stock from a side. Previous operations on these metering valves included turning, rough and finish forming the grooves, drilling, reaming, chamfering and counterboring in a 6-spindle Conomatic, washing, inspecting and induction hardening, shot blasting, lapping and centerless grinding OD

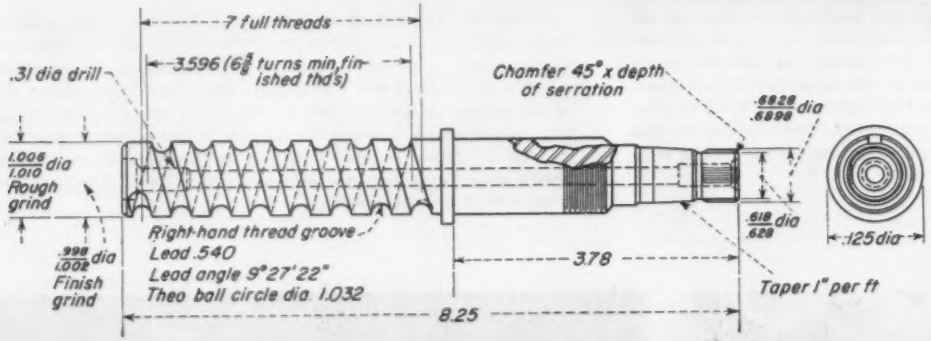


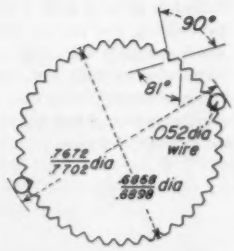
TANDEM ARRANGEMENT of three Cincinnati centerless machines connected by a conveyor feed speeds final operations on metering valves. First machine grinds OD to 1.001-1.002 in. dia, removing 0.003 in. of stock, while the second laps the OD to 0.9995-0.9997 in., and the third, (not visible) is equipped with a 20-in.-dia Osborn wire brush for deburring. Finish is spot-checked with a profilometer to within 10 mu in. rms or better, while OD's are checked within plus or minus 0.0001 in. on a Federal air gage

Small parts for power steering ... continued

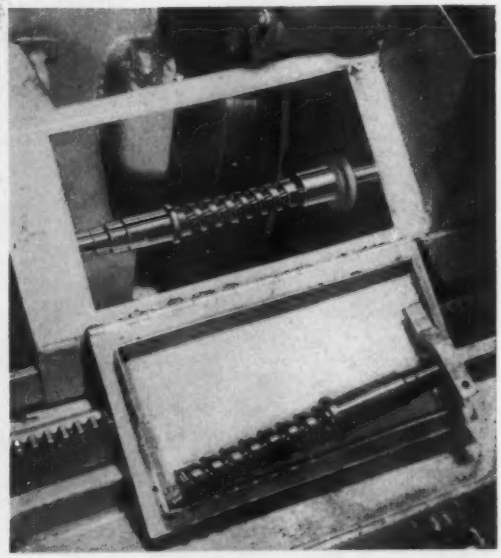
BROACHING DIE AND A HYDRAULIC PRESS produce precision serrations on the end of a worm shaft. Work is held in a special fixture with an air-operated clamp—average production rate is 5 pieces per minute. Die, through which coolant flows, is held in the ram and is guided on pins to the fixture. When worn it is turned over so the opposite end can be used. Life is approximately 2700 pieces before this is necessary



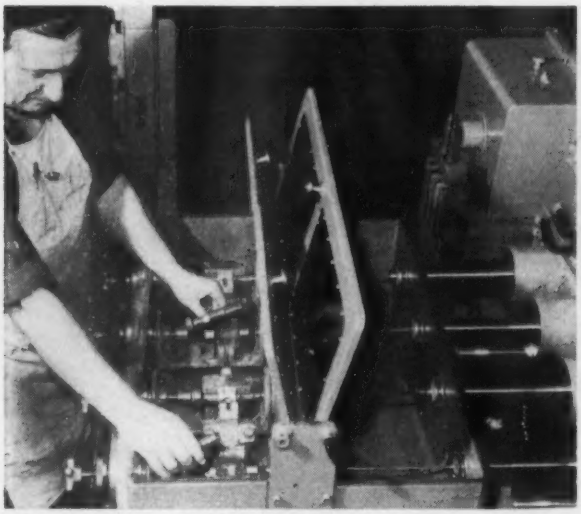




DEEP-HOLE DRILLING is done in this bank of Leland-Gifford machines, set up to produce a 0.257-in.-dia clearance hole through the 8¼-in. length of a worm shaft, one in each of six fixtures. Work is mechanically clamped on the OD and held between two locating pins, resting on a center engaged in the bottom end. Spindles automatically reciprocate to clear the deep hole of chips while rotating at 1200 rpm to feed the drills through at 0.004 ipr. Operator loads and unloads each fixture and changes drills every 3 hr—sharp drills being especially important for good performance in this setup. Production rate averages 180 pieces per hour

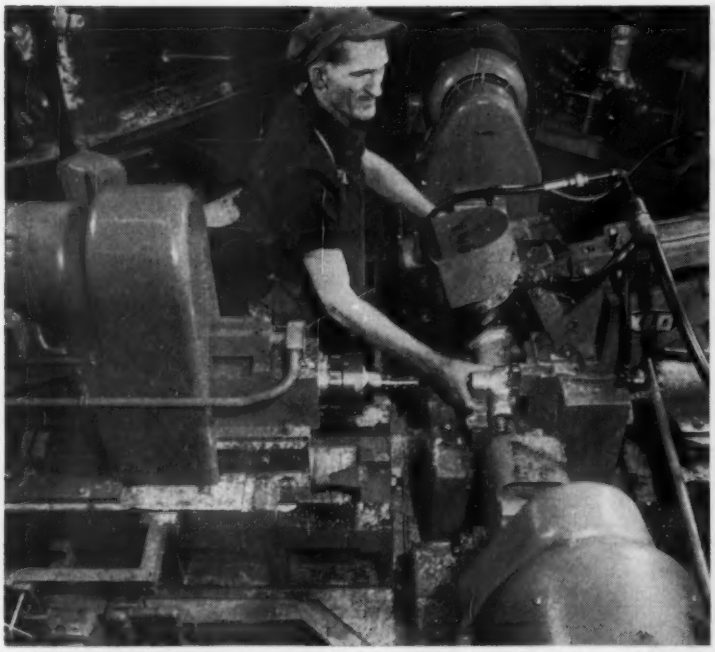


AUTOMATIC THREAD GRINDING of worm shafts maintains end-to-end lead tolerance of 0.0001 in. in J & L machines. Here the rough grinding cut is taken in one direction, finishing in the opposite, completing the operation in two passes. Wheel is automatically diamond dressed after finish pass. Work is held between centers with preset driving dogs establishing location of worm thread. Worm was previously hobbed followed by washing, inspecting, heat treat, lapping centers and straightening. One operator tends two grinders, produces about 131 pieces per hour. Worms are sized and matched within 0.0005-in. tolerance over wires according to color code



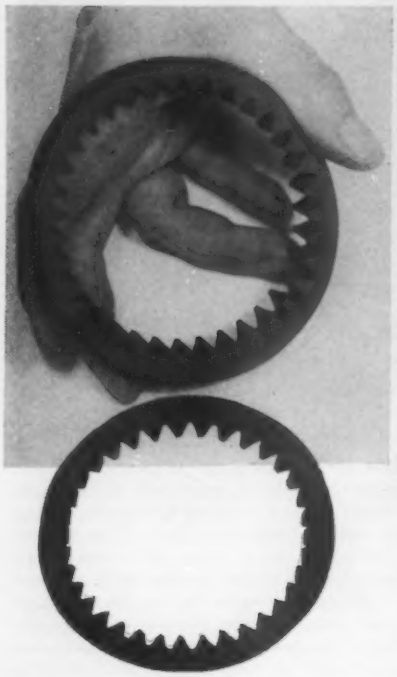
GUN DRILLING with carbide-tipped drills produces a 0.261-0.264-in.-dia hole through 5½-in. long upper rod. Four-spindle Krueger-Barnes machine has spindle speed of 3360 rpm, oil pressure at 600 psi to remove chips and cool cutting edges. Parts are loaded into V-block fixtures where screw clamps locate them against previously machined ends and hinge clamps hold them down in the V's. Drilling cycle takes about 3½ min

SINGLE INDUCTION COIL for two diameters is employed in this special General Electric unit for hardening upper rods at two separated places. Work is nested in freely rotating ball-bearing fixture which the operator spins after loading. Cam drive raises the fixture through the coil, timing its travel during the down stroke when the coil is hot. Uniform depth of heat penetration is obtained by slower travel when small diameter to be heated passes through coil and speeding the travel when the larger diameter goes through. Sharp rise on the cam causes the fixture to jump past the coil when areas not to be hardened reach it. Small end of the rod to be thread-rolled later is typical of areas left soft. Quenching, of course, occurs on the down stroke, and the total cycle time per piece is 30 sec



FINISH BORING aluminum housings to close tolerances is done with carbide tools in this special 4-spindle Ex-Cell-O machine. Work is loaded into a central fixture locating against a previously machined flat surface and an air-operated universal V-clamp holds it down. All tools are timed to avoid interference—one enters the housing to finish-bore a half-circle on the cover face and produce a 45° x 1/32-in. chamfer, while another finish bores a 1.264-1.267-in.-dia hole in the bottom of the cylinder bore and at the same time counterbores and chamfers it to 1.684-1.687-in.-dia 5/16 in. deep. Third head finish bores and chamfers a 1.4985-1.4995-in. dia shaft hole, finishes a counterbore to 1.684-1.687- in. by 29/64-in. deep and produces a 30 deg by 1/32-in. chamfer. It also cuts a lock ring groove in the counterbore 1 25/32-in. in dia, 0.324 to 0.332-in. deep. The last head finishes a 1.374-1.375-in. dia bearing area and a 1 9/32-in.-dia shoulder

UNIVERSAL WORK-HOLDING FIXTURES on final-assembly conveyor can be moved in any direction to simplify installation of power steering components. Pressure adjustment on ball joint regulates freedom of movement. Special conveyor carries assemblies in-progress from one end of air-conditioned room to the other where, after numerous checks, the finished units are removed and placed on a monorail for transfer to assembly plants for installation



INTERNAL GEAR BLANKS ARE BROACHED two at a time to produce precision gears for automotive transmission pumps. Two blanks are held in a fixture, locating on faces previously ground parallel to each other, while the broach forms teeth with involute profile error held within plus or minus 0.00025 in., spacing within 0.0005 in., lead error within 0.0003 in., and lead variation within 0.0005 in. Buttons following finishing teeth on the broach machine ID concentric with pitch diameter

Broaches hold internal gear teeth to tenths

DALE O MILLER, JR, factory manager, ROCHESTER (MICH) GEAR WORKS

AUTOMATIC LOADING AND UNLOADING gear blanks in this face-grinding setup speeds preparation for broaching which follows. Here faces are ground parallel with each other within 0.002 TIR. Blanks are fed to rotating workholding disk by means of gravity-feed chute, ejected by a spring clip that engages the work at the bottom of the disk

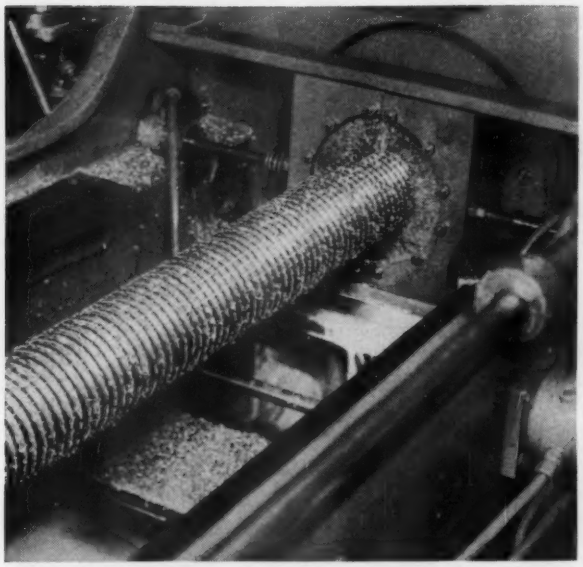
Front and rear internal pump gears for automotive transmissions are being mass-produced to close tolerances by broaching the teeth without any subsequent gear-tooth finishing operations. Made in two sizes, the front pump internal gear is about 11/16 in. wide and has 35, 10-pitch, 24° PA internal gear teeth. The rear pump internal gear has the same number of teeth and is about 5/16 in. wide.

Extremely close tolerances are held as far as tooth profile, parallelism and spacing are concerned. Relationship of the ID, OD, faces and tooth-pitch diameters must also be held to close tolerances. Further, the gears must be absolutely burr-free and have sharp corners at the tooth edges.

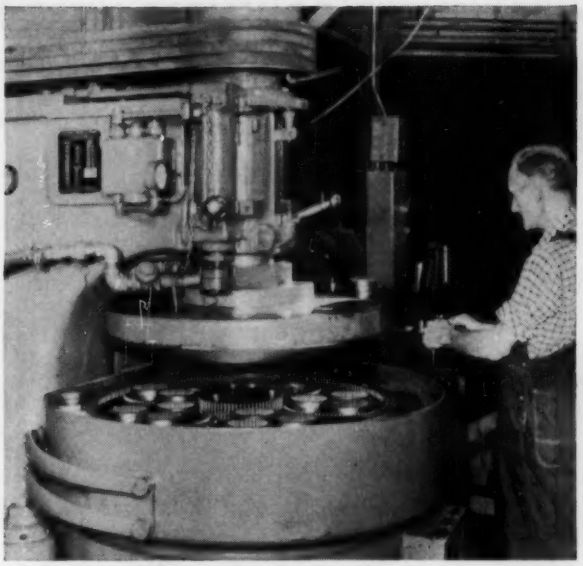
"TENTH" TOLERANCES

Print specifications call for involute profile errors to be within plus or minus 0.00025 in. Spacing is held to 0.0005 in., lead error within 0.0003 in., and lead variation within 0.0005 in. Both faces must be parallel and square with the pitch dia and the OD within 0.001-in. indicator reading. The faces must also be held to a thickness tolerance of 0.0003 in. and have a surface finish of 50 mu in. rms max. Pitch dia relative to the OD must also run within 0.001 in. indicator reading.

Careful processing and extremely accurate broaches that finish the ID of the gears as well as



SPLIT BRUSH REMOVES CHIPS from broach on return stroke. Air cylinders actuate two holders in the rear of the fixture—each having one-half the wire brush. Production rates have been jumped by cleaning broaches after each pass, 175 pieces 11/16 in. thick being broached per hour, two at a time



FINAL THICKNESS of internal gears is held to 0.0003 in. This and a surface finish of 50 mu in. rms, max, are accomplished in a multiple setup on this Norton Hyprolap. Rough lapping after broaching removes majority of the burrs, throws small burrs back into the teeth. Wire brushing throws them back out again, after which finish lapping removes them while establishing thickness and finish

High-volume production of internal gears for automotive transmission pumps is simplified by broaching the teeth to extremely close tolerances without subsequent operations. Here's a description of the job—and the tools and setups that do it

the teeth permit consistent production of gears to these extremely close tolerances.

BLANK IS TUBING

Gear blanks are SAE 1146 seamless-steel tubing and are first turned, bored, and cut off on 4-spindle Conomatics. Then the two faces are ground in an opposed-wheel Hanchett disk grinder where the two faces are made parallel to each other within 0.002 in. Here a gravity-feed magazine loads blanks individually to a disk which rotates between two grinding wheels, and a spring clip automatically ejects them. After face grinding, blanks are chamfered on the OD and ID on both sides to remove all machining and grinding burrs.

Internal broaching is done in a horizontal machine with a specially designed 72-in.-long Red Ring broach made by National Broach & Machine Co. This broach has buttons following the gear-finishing teeth to broach the ID of the parts truly concentric with pitch dia. Two of the 11/16-in.-thick front-pump internal gears are broached at a time in this operation at a rate of 175 pieces per hour. Four of the thinner rear-pump internal gear teeth are broached at a time. In both cases, blanks are loaded into a pot chuck, or ring, in which they are a slide fit. Located against previously ground faces, they and the ring are held against the machine faceplate during the broaching cycle by cutting pressure of the tool. Main purpose of the confining ring is to prevent expansion or distortion of the thin-wall gears during the operation.

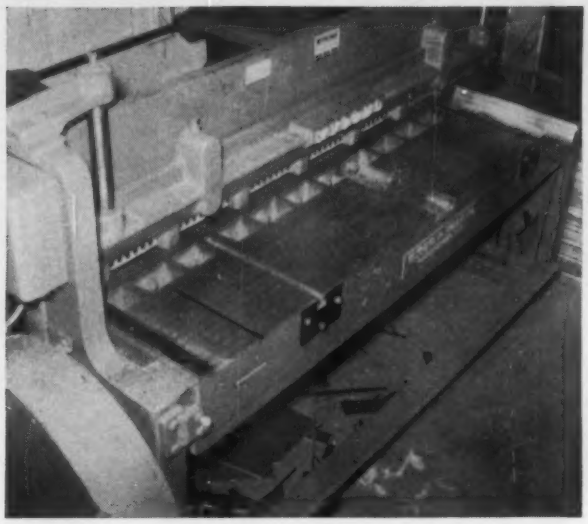
To speed output in this setup, a shop-designed air-powered wire brush has been installed to remove chips. This internal wire brush is split in half and mounted in air-cylinder-controlled holders at the rear of the broaching fixture. When the part is being broached, brush halves are automatically retracted. As the broach returns to broaching position, the brushes close and chips are removed. This brush arrangement has doubled output of the broaching operation.

Following broaching the two faces of the gears are rough lapped to remove most of the broaching burrs and throw any small burrs back into the teeth. Removal of these last, tiny, burrs is accomplished by wire brushing the gears to throw burrs back out again. Then the gear faces are finish-lapped to provide the specified burr-free, sharp, tooth edges while removing a final 0.0005 in. of stock. Final thickness and surface finish are obtained in this operation at the same time.

Finally, the gears are ground concentric on the OD by mounting them on an arbor that bears on the finish-broached ID of the teeth. No further tooth-finishing operations are required.

• EQUIPMENT CONFLICTS WERE NUMEROUS

HACKSAW LOCATION permitted cutting only short lengths of stock as surface grinder interfered. Meanwhile, aisle was blocked and grinder operator was nervous



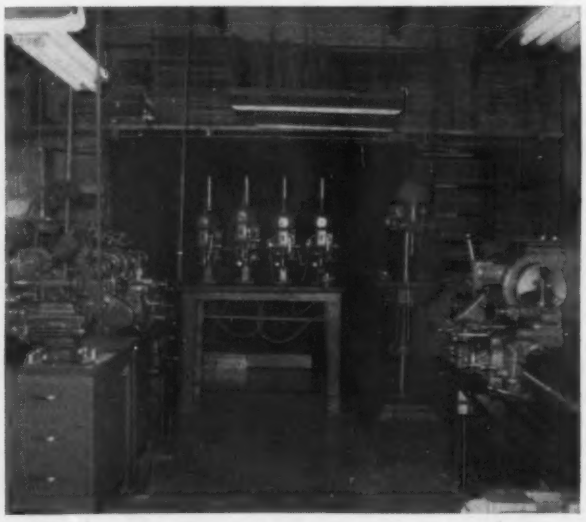
SHEAR was parallel with shop wall. Use of shear was limited to fairly short lengths and operator had trouble working behind machine to make adjustments and clean area

WEEKEND WHIRL: *How to cure*

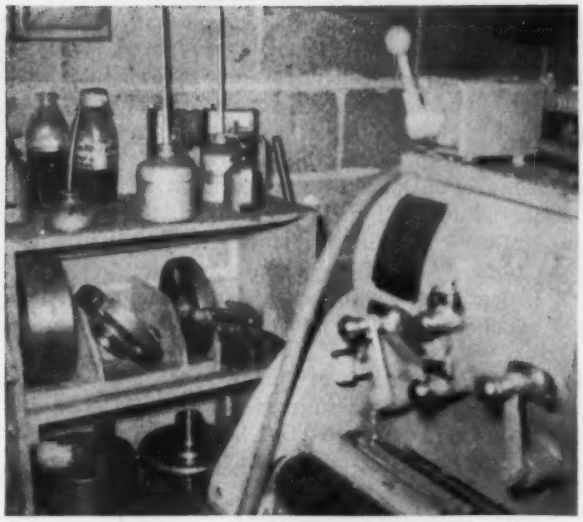
Rapid growth and a flood of demands for our electro-mechanical products filled the shop with new machines, men, and materials. Before we realized it, the original shop layout had blossomed in all directions. Then it became apparent that the price of getting out the work on the present basis was eventual self-strangulation. A new layout was essential but we could not afford to lose production during the overhaul. Here is the program that worked for us. It might help you

• NOW WE CAN BE PROUD

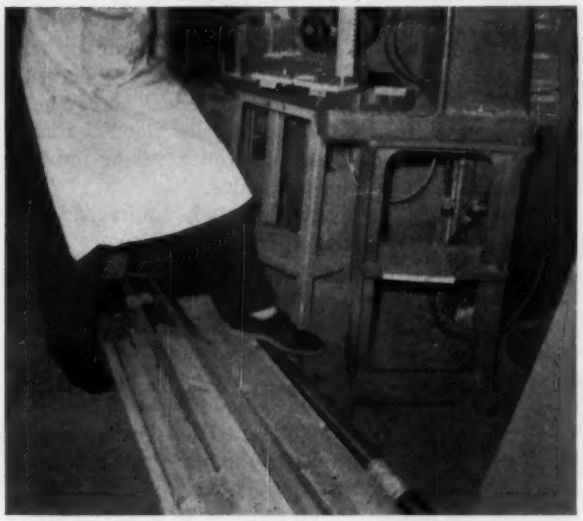
LATHE IS PARALLEL to wall, with plenty of clearance around headstock to permit feeding long bars. Smaller lathe, back-to-back, can be used for secondary operations to speed output



CLEAR AISLES and adequate floor space improve working conditions *and efficiency*. New machine arrangement provides better utilization of space plus faster work handling



LATHE WAS PERPENDICULAR to wall. Though we use bar stock, bars had to be cut to short lengths to permit feeding through spindle. Shelf unit was catchall for junk



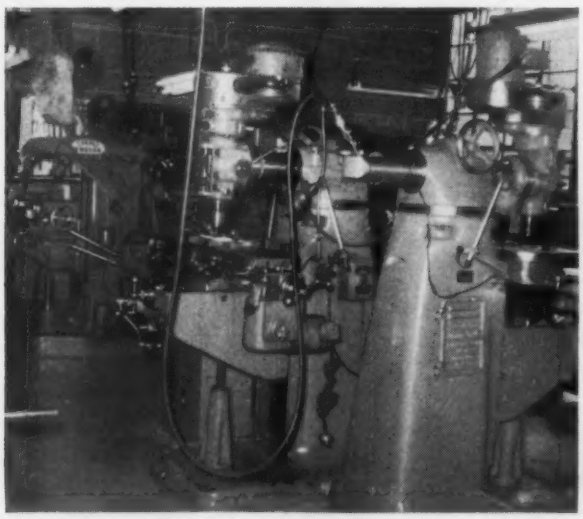
STOCK frequently would accumulate in aisles so mechanics would have to stand on it to operate equipment. This doesn't help morale or safety, not to mention output

shop shambles

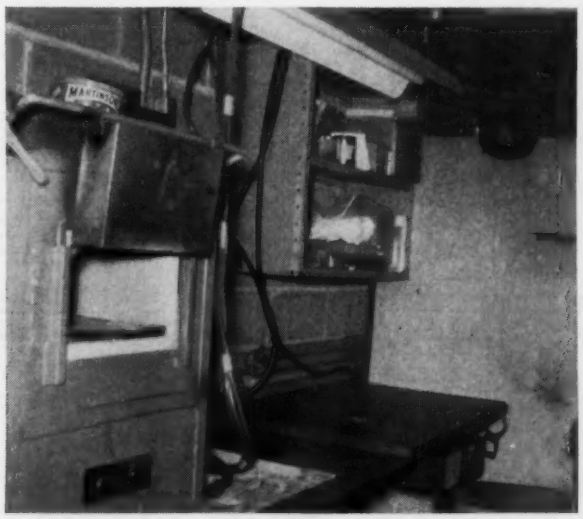
JOHN GELL, plant manager,
POTTER INSTRUMENT CO, GREAT NECK, NY

To avoid stopping production, we planned a detailed procedure that covered every step of the new layout program. This plan started with an up-to-date copy of the facilities list. Each item of equipment on the list and every machine tool was given a shop number. Then the floor area required for each unit was measured and rough-sketched right on the facilities list, with a mark to denote operator position. Also, the numbering system was used to divide the facilities into three categories: sheetmetal shop, machine shop, and welding shop. With this list complete, a layout of the present shop floor was roughed out to show the location and area required for every unit. A second, accurately scaled, drawing was made to show the floor area without machines or equipment.

A complete inventory of raw materials, parts, com-



MILLING MACHINES, placed as shown, require a minimum of floor area yet their operation is not hampered in any way. New layout is flexible, to permit changes or additions of new equipment



SPECIAL ROOM for welding and heat-treating eliminated jumbled mass of wires and hoses that formerly clogged one corner. Now generator and tanks are in separate rooms adjacent to this room; wires and hoses come in overhead for convenience and neatness

ponents, fittings, fasteners, tools, jigs, fixtures, etc, was prepared as the second step in the program. One of the major problems was the way these items had become scattered all over the shop, so money was wasted on purchasing duplicate material because materials already on hand were "buried" somewhere and time was wasted in hunting for needed items, as well as in working in cluttered areas or moving equipment through blocked aisles.

With *all* of these things listed, numbered (or counted and measured), and located, we were ready to go to work on the actual plan for rearrangement. However, one other step was fulfilled first. We made a detailed study of the nature of the parts and processes that were normal (or unusual) to our shop operation. While this information is pretty well known to the shop people and while we paid particular attention to it during the initial collection of information, we still itemized the more important influences on production flow. Thus, we were able to plan the rearrangement so time losses between operations are reduced and fewer conflicts and interferences occur. Process integration is much improved.

In developing the plan, we brought together all of these elements, evaluated them, then prepared a detailed, step-by-step procedure list for each phase, plus a detailed drawing of the rearranged layout. A second list was prepared simultaneously to itemize the equipment, such as mason's cord and chalk, rollers for moving machinery, and electrical equipment, that would be necessary to carry out the rearrangement. One very important consideration in preparing this procedure list is the time of people like electricians, plumbers, etc. Planning should allow time for them to accomplish their tasks before the moving crew is ready to go to work on the equipment. At the same time it should assure that machines and equipment will be ready to have utilities connected or disconnected so utilities people will not stand idle while preliminary tasks are completed.

Separate procedure lists were prepared for each phase, including: machine-shop, sheetmetal shop, welding shop, and shipping room. For example, here is a part of the sheetmetal shop list:

1. Move drillpress bench into place.
2. Connect outlets on back of bench.
3. Install swing light in front of drillpresses.
4. Unload Verson die and stock shelf, move into position, and reload per print.
5. Unload old workbench and disassemble. (Keep bench with sliding doors for Inspection.)

. . . . .

12. Disconnect electric to Verson
13. Mount Verson on rollers; roll into place
14. Unload and remove 11-ft bench
15. Swing Chicago Brake as shown on print
16. Disconnect Wysong shear, mount on rollers, move into place (See print)
17. Wire Verson
18. Wire Wysong

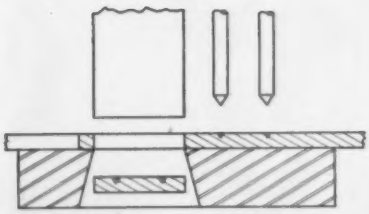
As each item is completed, it is checked off the list.

Three task groups, each with a group leader, were set up from among the men in the shop who were willing to work over the weekend. Then each group was given a specific procedure list and we did a dry run on the plan to show each group what to do.

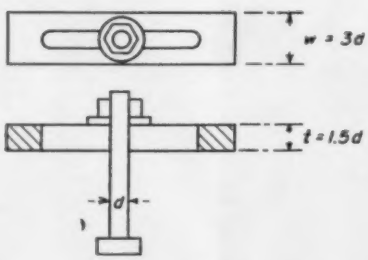
Actual rearrangement was started in one corner of the shop, by installing a new shelf to move some material out of the way; thus provide a clear area. With some minor rearranging and, especially, cleaning up done during the previous work week, the major tasks began on Saturday morning. We worked Saturday and Sunday. The job was done and the shop ready to continue production on Monday morning.

Diemakers Kinks

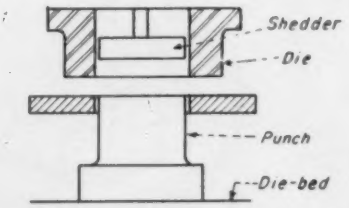
FEDERICO STRASSER



WHEN SMALL, round holes cannot be punched in a progressive piercing and blanking die, mount center punches at the correct centers in relation to the blanking punch. Then, the blanks will be prick punched ready for drilling, especially when drilling fixtures are not to be used



CLAMP DIMENSIONS are usually selected on an arbitrary basis. A good rule of thumb is: clamp thickness should equal 1 1/2 times the bolt diameter, and the clamp width 3 times the bolt diameter



VERY LARGE BLANKS are best produced in inverted dies, in which the die proper is fastened to the press ram and the punch to the press bed or bolster. Both of these can be solid, because the blank is usually ejected to the rear of the die by gravity, as in an inclined press

Round Table

Rumor Board

"I'm happy to see that somebody in Management had the guts to do something constructive about the wild rumors that keep circulating around the shop. Have you seen the new 'Rumor Board' at the tool crib, Ed?"

"I saw it, but I'm not impressed, Al. The main trouble with rumors is that you're dealing with gossips; and I never met a gossip yet who would let the truth interfere with his fun."

"It seems to me that if the company admits there's a rumor going around, and tells the truth about it right on a bulletin board, that ought to stop the rumor cold."

"Well, that's the idea, I guess, but a genuine gossip will just claim that when the company admits there's a rumor, it's just proof that the rumor is true."

"Now what kind of logic is that, Ed?"

"Who says it's logic? In the first place, a person has to be pretty stupid to circulate the kind of story we're talking about, because he has to halfway believe it himself. Of course the 'Rumor Board' will straighten out a lot of the men, but there'll still be a few who just won't pay any attention, no matter what you do. They're the kind that keep rumors going."

"Then you admit that the 'Rumor Board' will probably do a lot of good."

"I don't think it will do much good, Al. The people who don't pay any attention to rumors will read it and believe what's there, and those who spread gossip will just scoff at it, and continue to carry tales."

"But how about the men in between—the ones who might believe a rumor if nobody denies it, and who won't if the company issues a statement and gives the facts?"

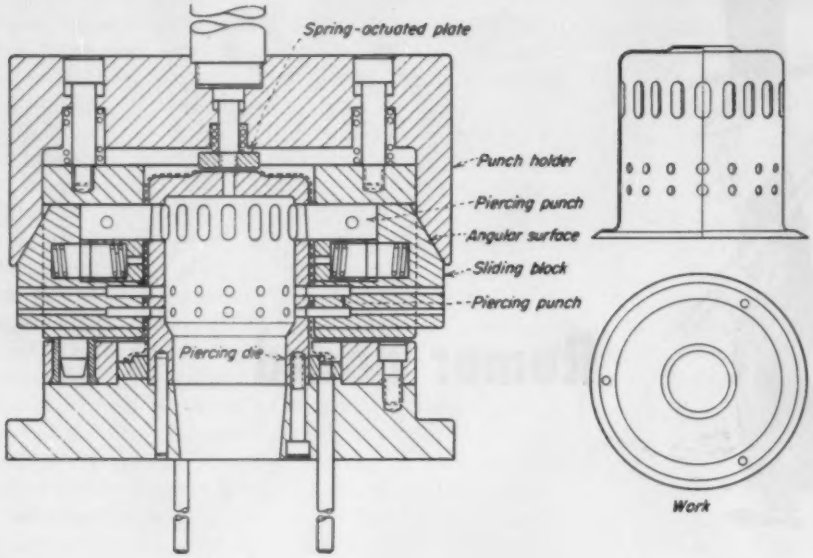
"Maybe the board will straighten out a few of those, Al, but I just don't think it's a good idea for the company to keep making statements all the time giving out information that probably shouldn't be given out."

"I don't believe in keeping the employees in the dark when it's possible to let them know what's going on behind the scenes, Ed."

"Well, I do; especially when it's information that is supposed to be kept behind the scenes. The company has some right to privacy, Al."

IS A 'Rumor Board' a workable idea? Can an alert company keep its employees well informed of what's going on at top level and still keep their confidence? Your opinions may help others with similar problems. Discussions of earlier topics start on page 210.

Practical Ideas . . .



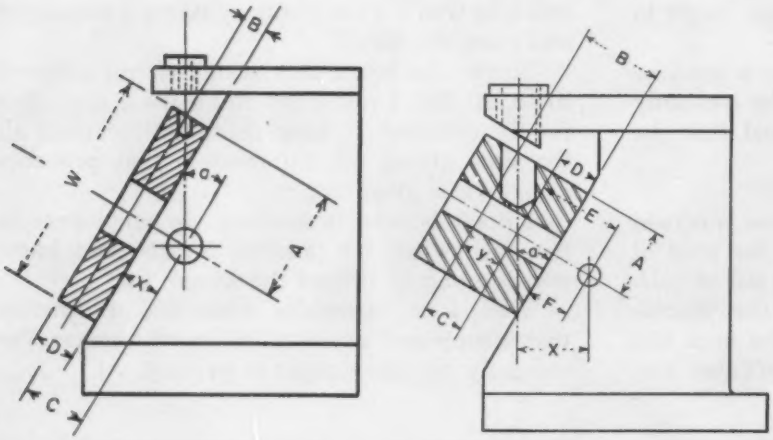
Combination Punch and Die Pierces 48 Holes In One Shot

Shown here is a combination punch and die which pierces 48 holes, in three rows, equally spaced around a drawn shell. The die is somewhat different from the conventional type. All the punches, which are fastened in sliding blocks around the die, follow the punch-holder and pressram up and down with each stroke of the press. This design was necessary to permit loading and unloading of the work.

The 16 sliding steel blocks are supported in a steel ring, and are actuated by coilsprings. The ring is a sliding fit inside the punch-holder, with movement controlled by four countersunk setscrews.

When the pressram descends, the steel ring hits the bottom of the die, and the angular surfaces of the punch-holder strike the angular surfaces of the sliding blocks, forcing the blocks inward toward the work. Punches held in the blocks pierce the holes. A spring-actuated plate at the top of the shell holds the shell firmly in place during the operation.

Before we designed and built this die, we were using a rotary piercing die with automatic feed. The new die works three times as fast as the old one. *Hjalmar Dahl, Upplands Vasby, Sweden*



Formulas To Drill Angular Holes

We received an order to drill a number of angular holes in rings of different thicknesses. Some of the holes were on the centerline of the ring, while others were not, and all holes had to be located within ± 0.001 in. To locate the holes properly, we worked from the bore and keyway, and developed formulas to give us the correct dimensions from a construction hole in the side of the jig.

The two cases—on and off the centerline of the work, are shown here. When the locating hole is on the centerline, these formulas result:

$C = R \tan a$

$x = C - B$

For the case where the hole is off the centerline:

$C = R \tan a$

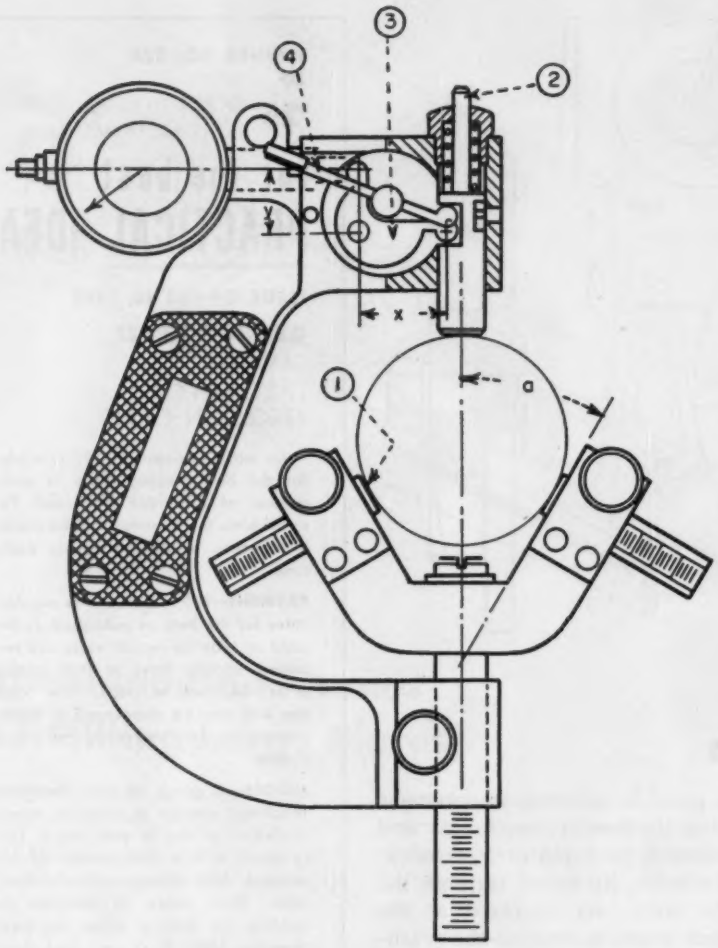
$D = B - C$

$F =$ any even dimension;

$E = F + D$

$x = E \cos a$

The method of holding the ring is not shown, as all that was required was to hold the ring firmly on the jig, and there are several ways to do this. *E C Porsberg, Northfield, Ohio*



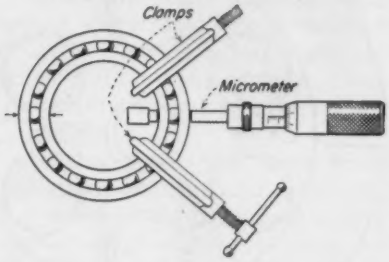
Comparator Checks Tools With Odd Number of Teeth

This gage can be used for checking the diameter of milling cutters, taps, and reamers, having an odd number of teeth, either straight or helical. It consists of a C-frame with bakelite grips to prevent expansion when held in the hand. A Y-shaped support slides in a hole at the bottom of the frame and can be locked by a screw. Two carbide-tipped contact pins (1), are set in the arms of the Y at an angle "a," depending on the number of teeth in the tool. These pins can be adjusted lengthwise, because they are supported on threaded studs, and they can be locked in place by setscrews.

The gaging pin (2) is linked to a dial indicator through a lever (3), on which the ratio of the arms $\frac{x}{y}$ is established by the formula $\frac{x}{y} = \frac{\sin a + 1^\circ}{2 \sin a}$. This permits direct reading on the dial indicator.

To use the gage, standardize it by a cylinder of known diameter, approximately the same as the tool to be measured. This is done by raising the gaging pin (2) with the lever (4) and adjusting the contact pins to some convenient position. Place the master cylinder on the contact pins and lower the gaging pin by releasing lever (4). Set the indicator dial to zero.

Remove the master and insert the work, rotating it on its axis. Movement of the indicator pointer either side of zero shows the amount by which the work is larger or smaller than the master. The tool can, of course, be used also for measuring the diameter of cylindrically ground work. *Ch Minaire, St Etienne, France*

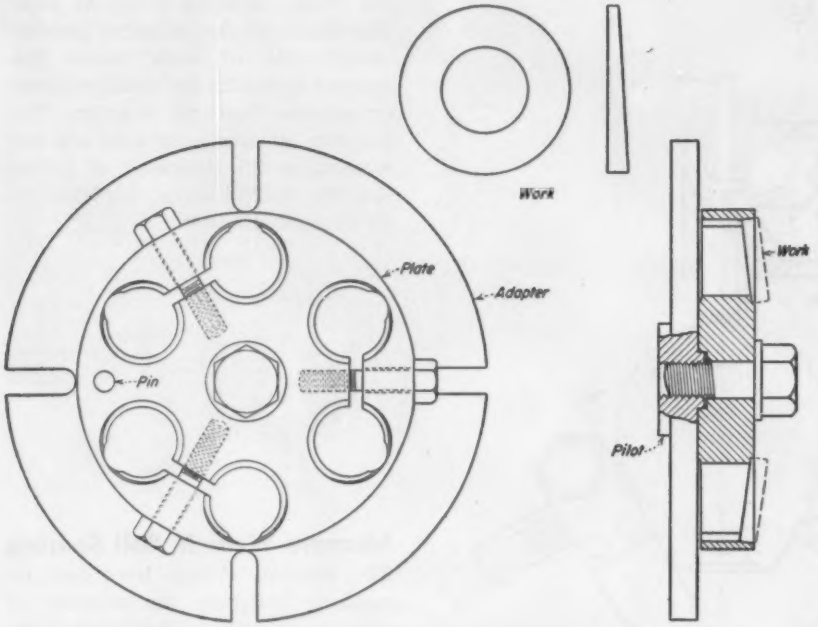


Measure Wear in Ball Bearing

The method shown here can be used to measure the amount of wear in a radial ball bearing. Two C-clamps are placed about 90° apart, as shown, to draw the inner and outer races snugly against the balls. Then a micrometer is used to find the distance midway between the clamps, to get a reading for the distance between inner and outer races. (It is not necessary to use a ball micrometer, as we are interested only in comparative measurements.)

Leaving the clamps in the same position, another reading is taken diametrically opposite to the first one. The difference between the two readings will be twice the amount of play between balls and races.

Do not force the clamps too tight, or the ball races might be distorted. *H J Gerber, Stillwater, Okla*



Flexing Lathe Fixture Grips Tapered Washers

Shown here is a lathe fixture which we used to face tapered washers, six at a time. The washers, used for boiler manufacture, were turned from bar stock, cut off, and loaded into the fixture.

The fixture consists of two parts —an adapter and a fixture plate. The stud on the adapter is located in the bore of a four-jaw independent chuck. Bolts passing through slots in the faceplate secure the fixture to the chuck face. The plate is recessed to receive a stud on the face of the adapter, and is secured by a pin and setscrew.

Six holes, jig-bored through the plate body, are recessed at the proper angle to receive the washers. The washers are gripped by tightening each of 3 radial setscrews. Slots in the faceplate permit the plate to flex slightly, as the screws are tightened, thus gripping the work. *A G Amos Jamshedpur, India*

Modified Twist Drill Cuts Thin Castings

We have used the design shown here to drill thin-walled castings —3/32 in. thick—avoiding heavy burrs and distortion of the work. In use, the tool acts as a trepanning tool, producing a clean hole. It also gives the advantage that the slug which is formed does not choke the cutter, as happens when using multi-toothed hollow mills for this work.

The drill point is ground away, to make the drill square-ended. Then a slot is formed in the web, and the two teeth resulting are ground with about 7° back rake, to form the cutting edges. The tool should be fed slowly, to reduce the chance of damaging either tool or work. *G R Milner, Gainsborough, England*

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ISSUE OF FEB 28, 1955

GEORGE HERZL

CAMDEN, N J

LAYOUT FOR PRECISION CAMS

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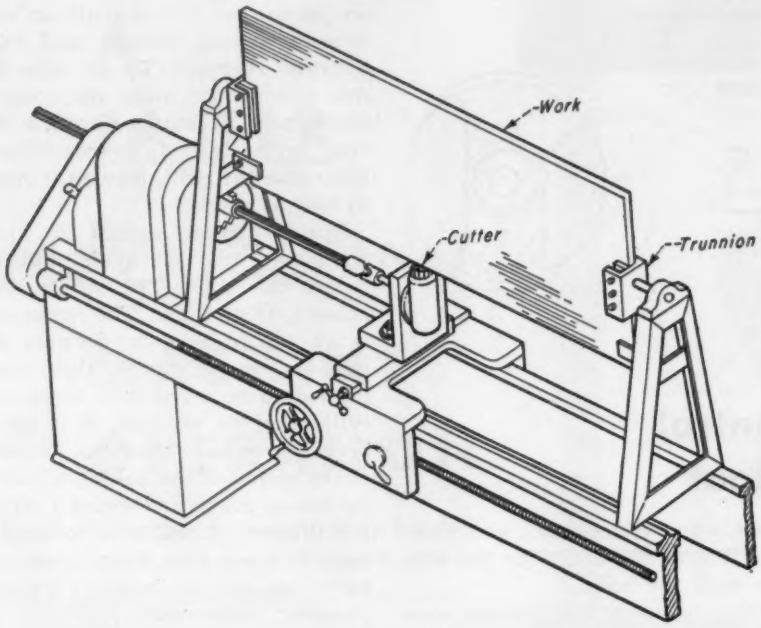
JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y



Lathe-Mounted Frames Aid Milling Large Plates

Job-shops often get work which is a little too big for their equipment. For example, we received a contract for an instrument assembly mounted on aluminum plates. All the work was within the capacity of our machines except for milling the edges of the plates, which had to be parallel and of uniform width.

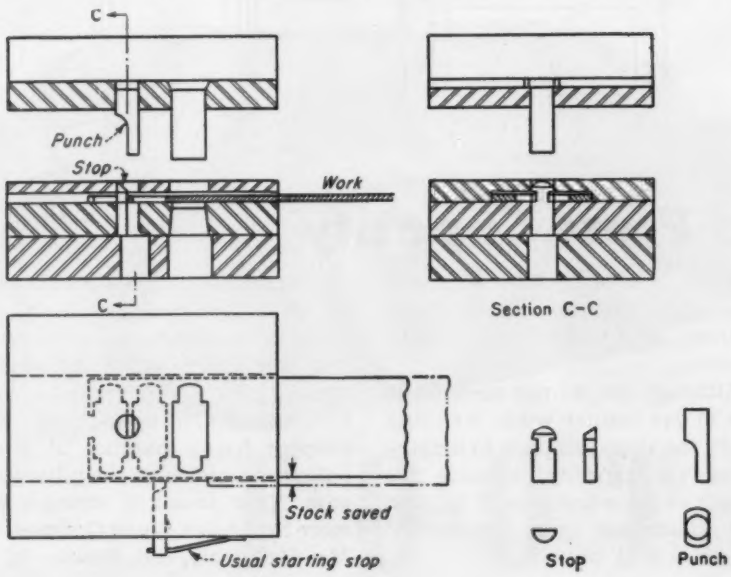
We did the milling job on a long-bed lathe with the setup shown here. We made two angle-iron frames and set them on the bed. These frames carried trunnions which gripped the plate.

Cutting was done with a vertical milling attachment from a small miller. The cross slide was removed from the lathe carriage and an angle plate substituted for it. Then the milling head was mounted on this plate.

Driving power was taken from the chuck of the machine, through a sleeve which drove a long sliding shaft through a universal joint. As the carriage traversed the bed, it milled the edge of the plate. At the end of the cut, the lower corners of the plate were unclamped from the stop-blocks, rotated 180°, reclamped, and the second edge was milled. This holding method insured that the edges would be parallel.

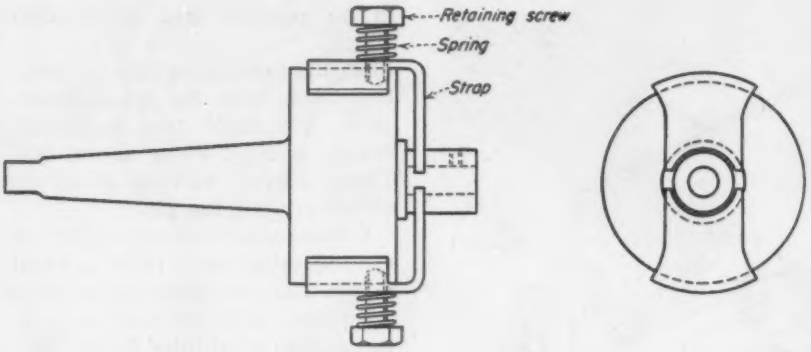
The width of the plate was controlled by shims under the trunnions, but a screw adjustment would have done just as well. *Robert Weidenhoft, Brooklyn, NY*

Stock-Stop and Scrap Cutter



Incorrect stop-design often causes loss of material and poor parts, lowering output and causing other manufacturing problems. The design shown here is a simple way to get precision work, and gives many other important advantages:

Compared to the standard side-cutter system, the central stop does not waste stock, as it uses part of the strip which is already scrap. Also, instead of making the punch and die slot in rectangular form, the circular punch works into a drilled hole. Other advantages include the fact that scrap is divided into two parts, which may be of help when strip is very wide, and the stock does not have to be lifted between strokes of the press, so the method shown can be used for automatic feeding. *Kurt Wagner, Sao Paulo, Brazil*

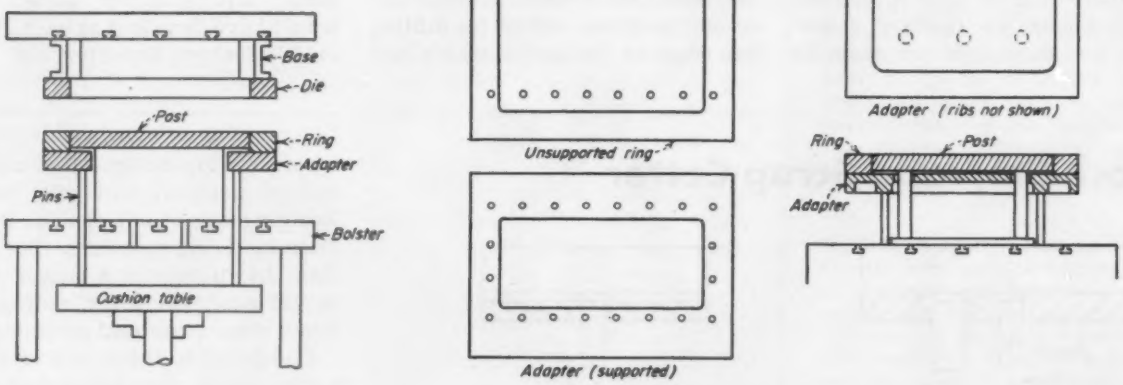


Springs and Straps Control Square-Bottom-Drill Float

We had been having quite a bit of trouble finish-drilling square-bottomed holes, because the drills were wearing too quickly. The float, which is necessary, was making it hard for us to line the drill up with the hole.

This condition led to undue wear on the corners of the drills, so we weren't getting enough tool life between regrinds. To get around this trouble, we made the holder shown here. It is quite simple, with two spring-loaded straps which centralize the drill, leaving it free to float as needed.

Spring tension should be just enough to hold the drill, until it enters the hole. The straps are about 1/16 in. thick. The retaining screw should be as far forward as possible to minimize the bore needed to hold the drill in place. With a screw machine, it is only necessary to have one strap, located at the bottom of the holder. (Gravity acts as the second spring.) With a drillpress, of course, it is necessary to have two straps, one on each side of the holder. *Walter Fivecoat, Indianapolis Ind*



Adapter Adds To Press Capacity

We have used the adapter shown here to increase the capacity of our presses when drawing large table tops. The pins on the bed are not wide enough (18 in.) for all our work, as we often have to draw parts 25 x 40 in. To support the post over its entire width, we made an adapter, as shown, which fits under the regular draw ring. Because the inside dimension of the adapter is 15¾ in., the pins will support it, and the outside of the adapter will support the blankholder.

Although we do not need to do this in our regular work, we could apply the same principle to lengthening the capacity, because the length of the adapter is 40 in., and the maximum pin - supported length is 41¼ in.

An alternate design is also shown, in which the adapter is in one piece, with ribs to reduce weight. The post is supported by pillars, and the pillars are threaded to steel bars which rest on the bed. The adapter has a number of small holes through which the pillars can pass. This design is stronger but more expensive. *Juan Gotauco, P I Manufacturing, Inc, Manila, PI*

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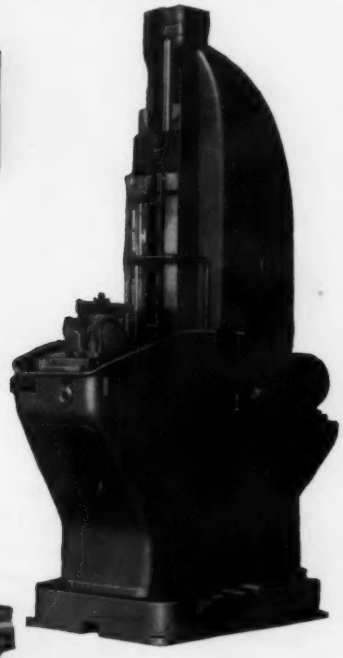

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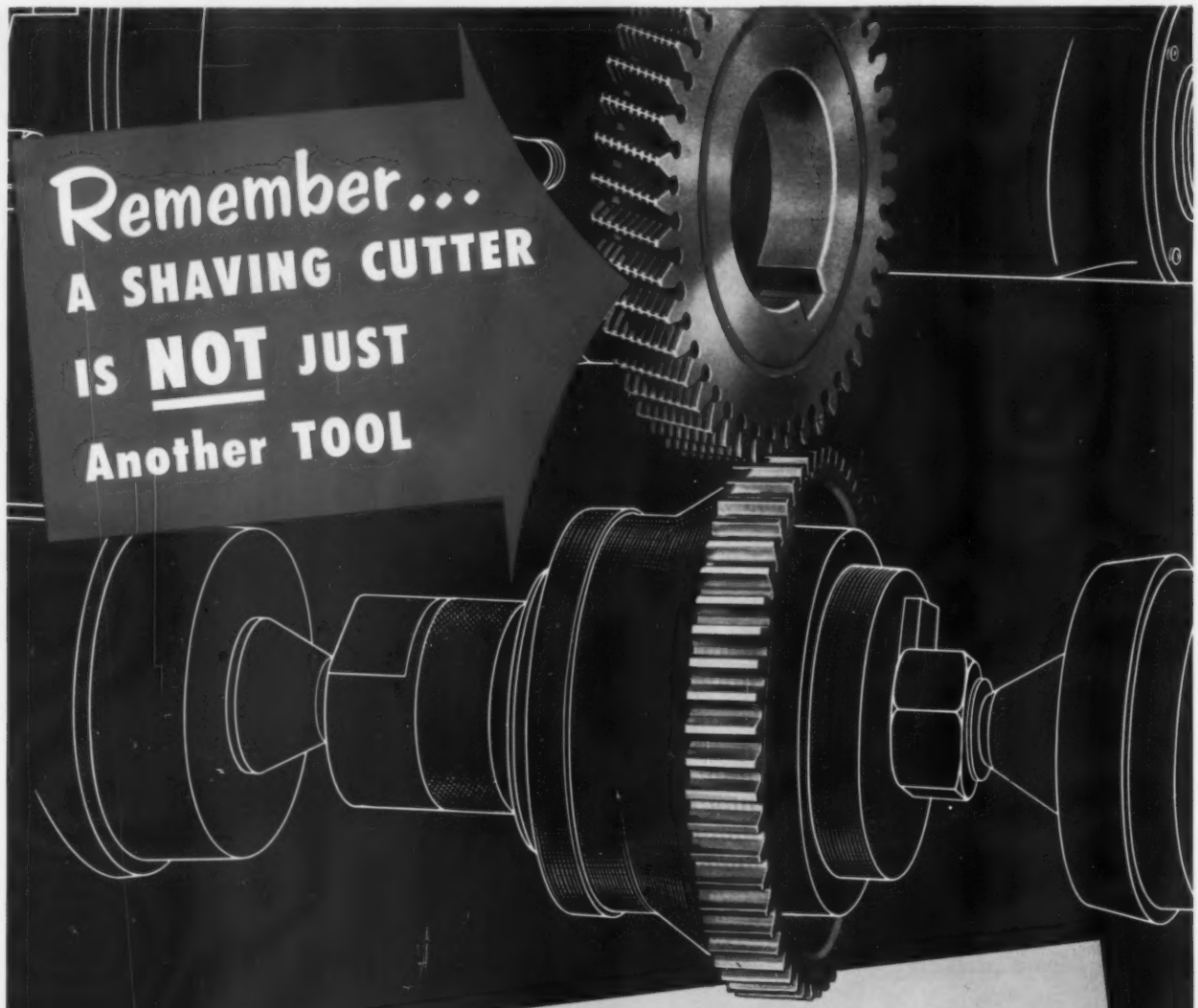

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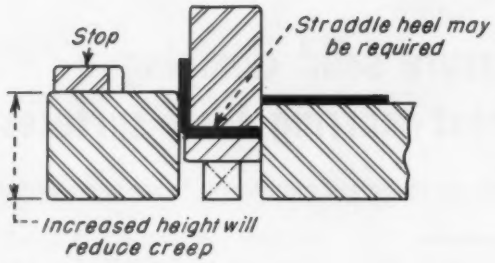
PRESS TOOLS FOR BENDING...I

DON R KING, tool engineering consultant

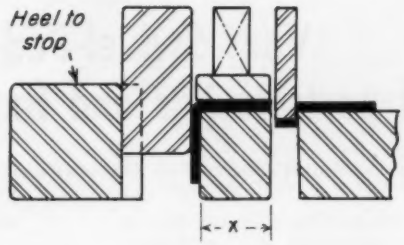
Selection of a suitable method is the initial step in designing press tools for parts that require bending. Often, for a given shape, there are several possible methods. To select the one best suited to your job, we give here schematic drawings of press tools to serve as a reference guide. These are classified according to standard arrangements to produce basic bend configurations. Notes under each sketch give the advantages and disadvantages of the particular design.

In most cases, the bend is shown as accomplished at the last station of a progressive die, in order to indicate the relationship of cut off. Of course, the construction may apply to intermediate stations, where the bend includes only part of the strip, or is turned parallel to the direction of feed. Dimensions "x" on certain sketches are likely to be critical in respect to part dimensions. They should be checked for limitations of die wall thickness or space.

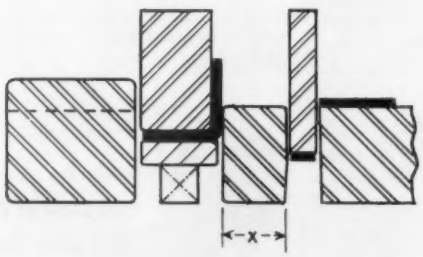
RIGHT-ANGLE BENDS



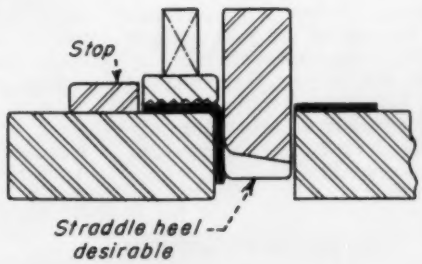
No. 1
Good location and alignment
Inclined ejection possible
Slight tendency for part to creep
No scrap waste



No. 2
Good location and alignment
Inclined ejection preferred
Scrap slug wasted
No creep if other punches are engaged
Large spring space needed in punch holder



No. 3
Alignment may depend on stock fit in stripper
Push-through ejection is possible
Some tendency to creep
Scrap slug wasted
Long cut-off punch required



No. 4
Inclined ejection required
Tendency to creep
No scrap waste
Punch sharpening more difficult than other designs
Large spring space needed in punch holder

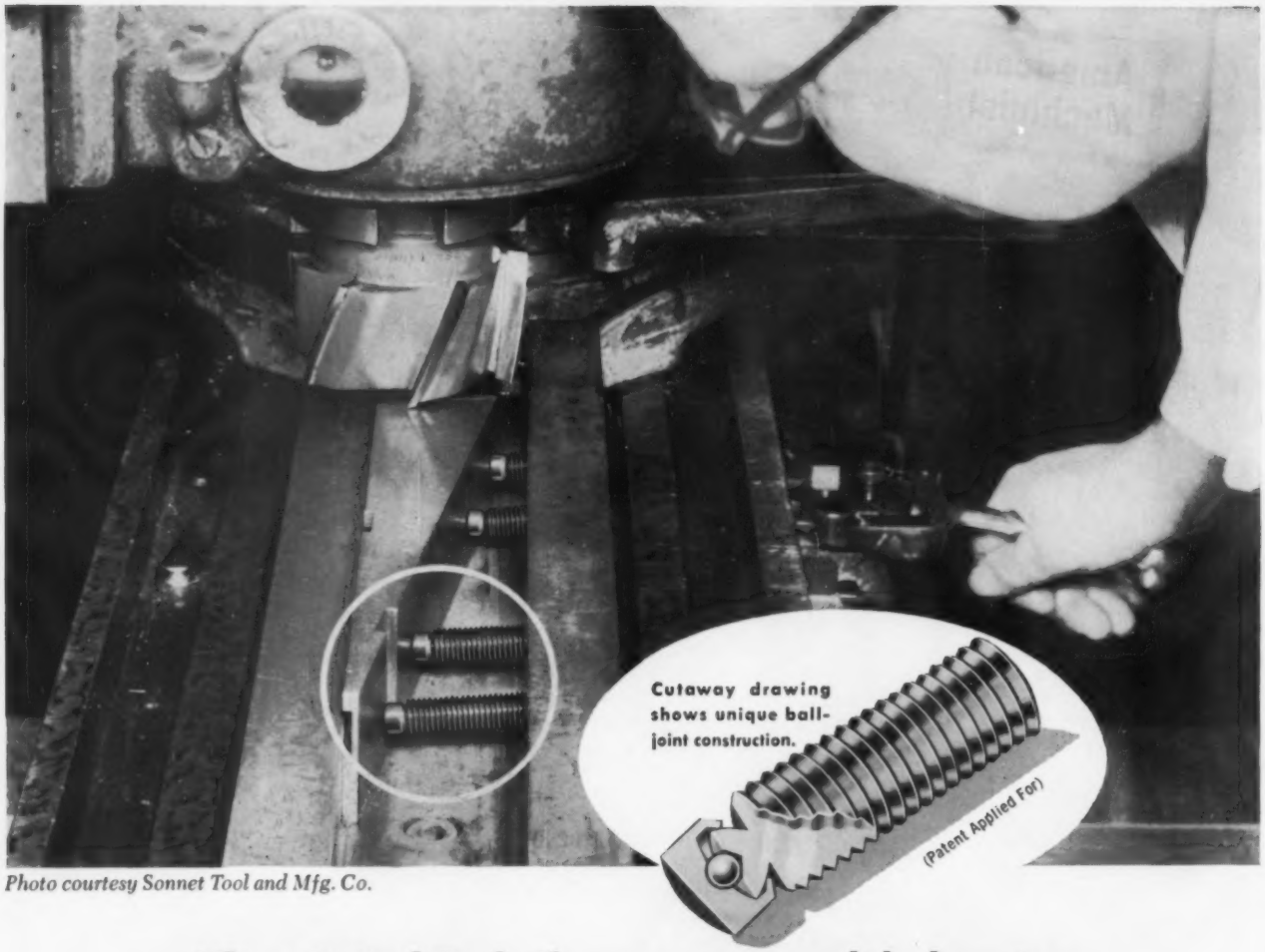


Photo courtesy Sonnet Tool and Mfg. Co.

Vlier Swivel-Pad Clamps assure solid clamping of parts in jigs and fixtures without marring their surfaces

Unique ball-joint construction prevents binding of the pad; assures automatic adjustment to off-angle surfaces

The mill fixture shown above demonstrates the usefulness of Vlier Swivel-Pad Clamps. Four Swivel-Pads are used to clamp the part rigidly in the fixture for the milling operation. Maximum rigidity is imperative in this setup if the high efficiency of the Sonnet "Helicarb" Shell-End Mill is fully utilized.

First touch of the pad against the work piece adjusts the pad face to the surface of the part and stops pad rotation. Extreme clamping pressure can then be applied to the part without damage, since screw torque is taken up by the pad, not the part. Swiveling the pad on a ball eliminates binding and assures frictionless adjustment to off-angle surfaces up to 7½ degrees each side of the center line.

Uniform clamping pressure

Design of the ball-joint causes the clamping force to be distributed equally to every point on the pad face. The pad is machined from solid stock for greater strength. The face of the pad is ground flat, not counterbored or relieved, for maximum holding surface.

Insert from either end

Since the pad diameter is less than the body diameter Swivel-Pads can be inserted in the jig or fixture from either end. This feature is especially helpful where space is limited.

Use it again and again

The body of the Swivel-Pad is made from heat-treated, alloy steel for high strength and long life. A special rust-proof finish prevents the tool from freezing in the jig or fixture.

Eliminate costly makeshift devices

These simple holding tools can save *your* tool room hundreds of dollars every year. Having them available eliminates costly machining of home-made devices and speeds tool manufacture and setups. Swivel-Pads are now available in 23 diameters and lengths. Call your Vlier distributor now and order an assortment of sizes.

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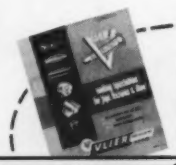

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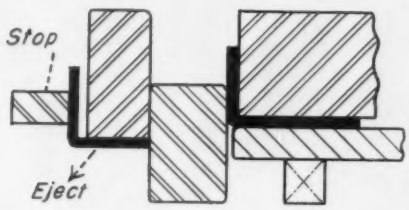
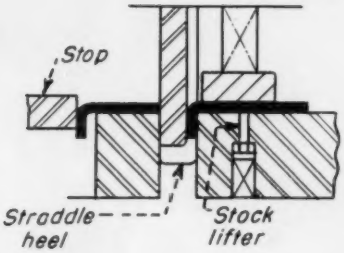
PRESS TOOLS FOR BENDING...II

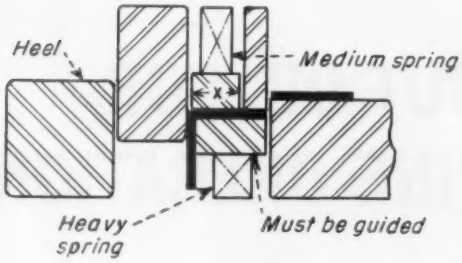
RIGHT-ANGLE BENDS . . . continued



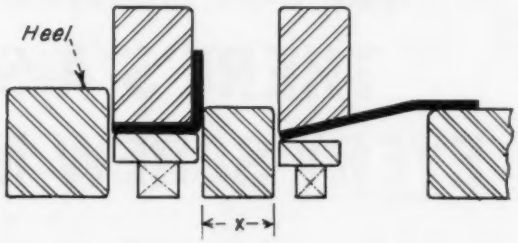
No. 5
- Requires inverted pierce and notch operations
- No creep if other punches are engaged
- No scrap loss
- Good ejection



No. 6
- For bends with short legs only
- No creep if other punches are engaged
- No scrap loss
- More difficult to resharpen
- Large spring space needed in punch holder

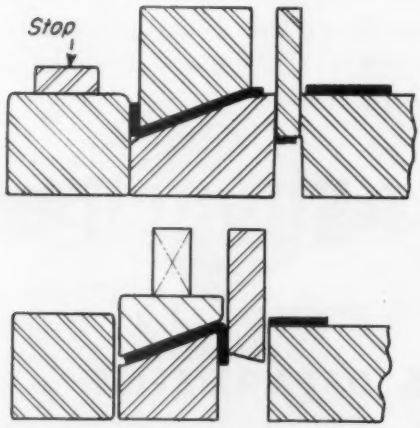


No. 7
- More complicated and costly than other designs
- Eliminates scrap slug, when forming downward is necessary
- No creep occurs



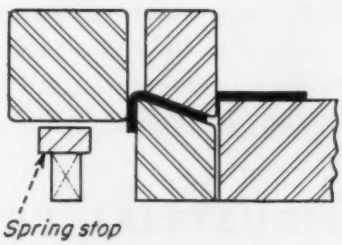
No. 8
- Limited to thin material and short forming travel
- Eliminates scrap slug, when inside form-up is necessary

ACUTE-ANGLE BENDS

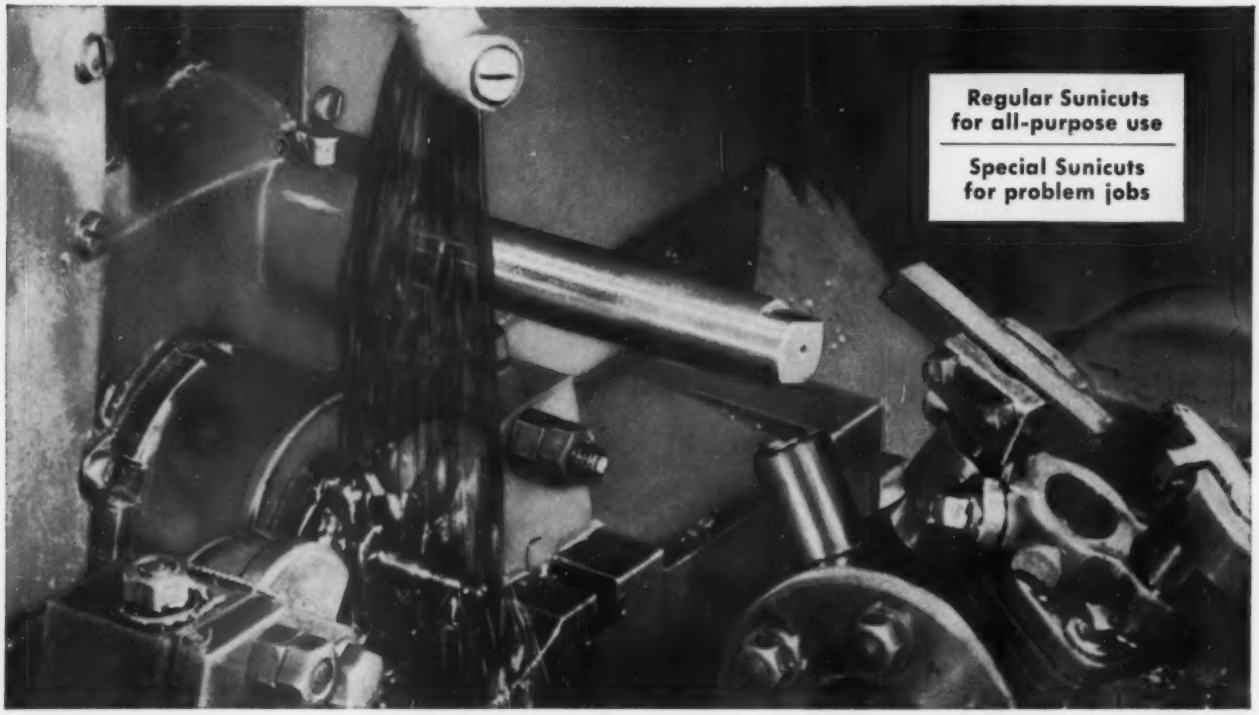


No. 10
- Suitable only for moderately acute angles
- No scrap waste
- Some distortion of stock is likely

No. 9
- Not suited to parts of all proportions
- Resharpening die may cause difficulty
- Scrap slug is wasted
- Distortion of stock and creep are possible



No. 11
- No scrap waste
- Not suited to parts of all proportions
- Resharpening may cause some difficulty
- Distortion of stock and creep are likely



to assure peak production...

THERE'S A SUNICUT OIL FOR EVERY SCREW MACHINE OPERATION

Today's Sunicut cutting oils are the result of years of research and on-the-job testing. And they're versatile, too. In many plants *all* screw machine jobs are being handled by a single Sunicut grade.

For the problem jobs, Sun makes a wide variety of special Sunicut oils, each designed to do the job better.

Your Sun representative has the practical know-how to analyze *your* problems. Working with Sun's experienced engineering staff, he's ready to help you pick the Sunicut oil that will give you the tolerances and finishes you want.

The Sunicut series for screw machines is only part of a large selection of non-emulsifying and emulsifying cutting oils available to help you get peak production at the lowest possible cost.

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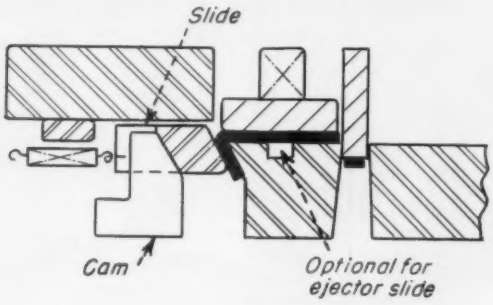
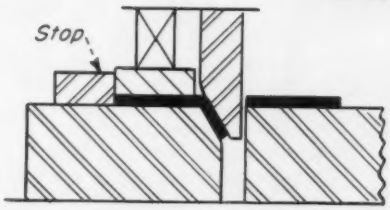
PRESS TOOLS FOR BENDING...III

ACUTE-ANGLE BENDS . . . continued

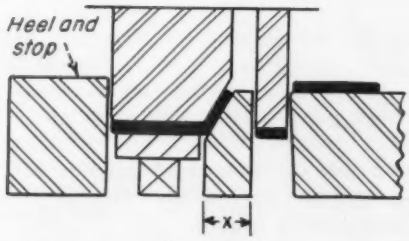


No. 12
Widest adaptability
Good-quality bends are produced
More costly than other dies
Inversion of design is possible

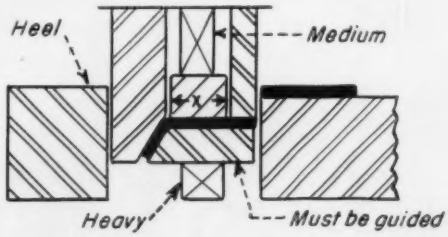
OBTUSE-ANGLE BENDS



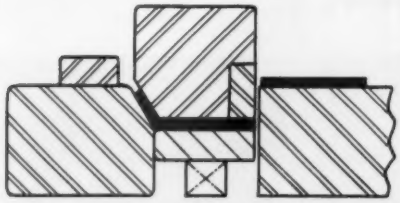
No. 13
Inclined ejection is required
Some difficulty in resharpening
Special backup heel may be needed
Large spring space required in punch holder



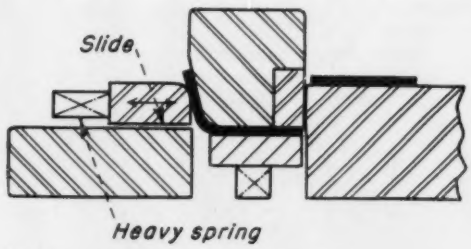
No. 14
Inclined ejection is desirable
Scrap slug wasted
Some difficulty in resharpening



No. 15
More complicated and costly than other designs
Scrap slug is eliminated when form down is necessary



No. 16
Good-quality bends produced on short legs and sharp corners
Stock distortion occurs on long legs or when angle is close to 90°

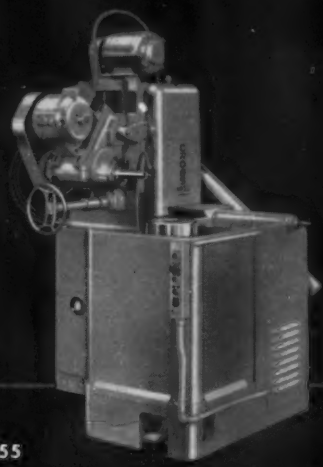


No. 17
Desirable design when bend radius is large, because follow wiper minimizes stock out of control
Usually unsuited to angles greater than 120°

To be continued in an early issue.

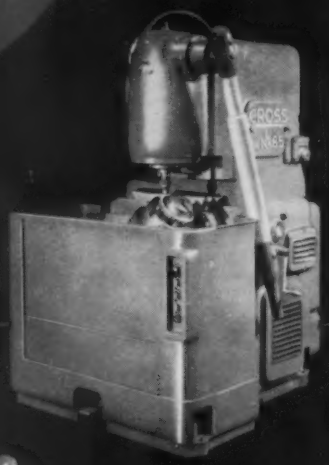
Greater Flexibility with Cross Gear Machines

for rounding • chamfering • pointing • burring



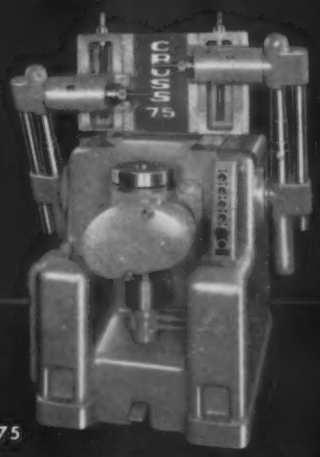
NO. 55

For rounding, pointing, chamfering or burring external and internal—
spur gears • helical gears
clutches • splines
Typical production—rounding or pointing 8 pitch 30 tooth gears—55 net hourly.



NO. 65

For pointing or chamfering external and internal—
clutches • spur gears
bevel gears • splines
Typical production—pointing 10 pitch 30 tooth gears—100 net hourly.



NO. 75

For burring or chamfering both ends at the same time—
helical gears • spiral bevel pinions
hypoid pinions
Typical production—chamfering 8 pitch 40 tooth gears—200 net hourly.

- ★ **Flexibility for handling a wide variety of gears.**
- ★ **Rugged, heavy duty construction for continuous high production or job shop operation.**
- ★ **Short setup time (as little as 15 minutes) for changing from one gear to another.**
- ★ **Simple, inexpensive tooling.**
- ★ **Push button controlled automatic cycle.**
- ★ **Hydraulic power work clamping.**

For mass production or short run jobbing operations, there is a Cross Gear Machine to suit your requirements.

Established 1898

THE CROSS CO.

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Special MACHINE TOOLS

Talking Shop . . .

Mechanical Brain

To get a modern electronic calculator set up for a function, the job must be broken into its elements by programmers. In one recent training course (supposedly serious) the instructor used the diagram at right to get the idea across. We picked it up from the house organ of the Baton Rouge (La) refinery of Esso Standard Oil Co.

Nylon Fasteners

ASSEMBLERS at Friden Calculating Machine Co, San Leandro, Calif, will have less trouble in the future with small horseshoe-shaped clips with which they fasten calculator subassemblies. They are being made of Zytel, a commercial nylon, molded 100 at a time, and color coded with dies that indicate the size of the center hole on each clip. The old metal clips often slipped and fell into calculator assemblies, where they blended beautifully with the small metal parts. The nylon clips will be bright and easy to locate. Nylon also flexes, allowing easier assembly, and resists chipping, breaking, and wear.

Insulated Drill

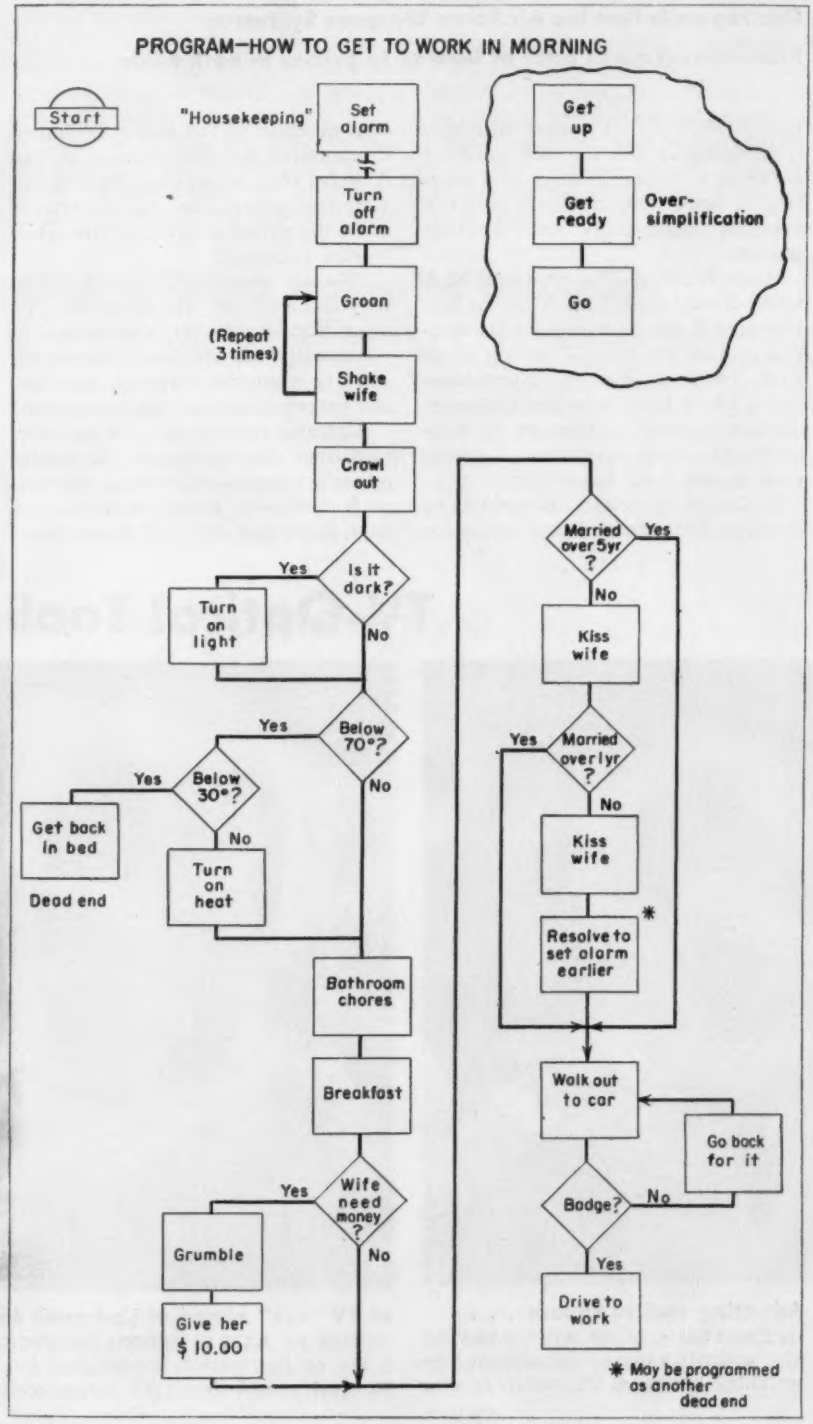
WHEN HOLES are drilled by the electrical-discharge method, the brass electrode normally produces a slight taper on the side of the hole because of electrical leakage across the gap between electrode and hole walls. This is often an advantage on die work. When it isn't, it can be avoided, according to Jack Halverstadt, of General Electric's Jet Engine Division, by lightly spraying the electrode with plastic from an aerosol dispenser (the type your wife uses to protect the shine on those brass candlesticks). Makes a good economical insulation that doesn't contaminate the electrolyte. And we might remind you that, more than a year ago, Watertown Arsenal discovered chrome plating will double electrode life.

Useless Maxim?

JOHN GOLDTHWAITE, of GM's Allison Div, brought the assembly to sharp attention at Mallory-Sharon's recent titanium symposium by propounding what he termed " a perfectly useless maxim."

A cannibal chief, expecting a visit from a group of missionaries, and fearing their souvenir-hunting habits, directed his men to put their valuables in hiding. The biggest problem was a handsome ivory throne—the chief's special pride. Finally, he found a place to hide it above the cross sticks at the base of the thatched roof of his hut.

But that night a high wind shook the hut, the throne fell on the sleeping chief and killed him. The maxim? *People who live in grass houses shouldn't stow thrones.*



News of Metalworking . . .

AVIONICS HASSLE: Who Should Equip

Who's playing in whose backyard? Electronics firms and airframe makers each think the other is getting out of bounds. One reason is that the Air Force Weapons System of Procurement gives a lot of leeway to primes in both fields

WASHINGTON—A major squabble is brewing in the aircraft industry between airframe makers and electronics firms over who will produce avionics equipment for military planes.

It was touched off some weeks back when North American Aviation Inc, revealed it would make the fire-control system for the "K" model of its F-86 Sabrejet fighter. Electronics firms, which have been handling production of such equipment on subcontracts from airframe makers, soon voiced their resentment.

H Leslie Hoffman, president of Hoffman Electronics Corp, told a recent meeting of the Radio Technical Commission for Aeronautics in Los Angeles that increasing activities of airframe companies in electronics were the prime concern of the electronics industry.

"We are puzzled," he said, "as to why some of our friends in the aviation business feel it is necessary to continually expand their electronics activity when the services, facilities, and personnel are already available."

Airframe makers, in turn, are worried over the success of electronics manufacturers—and other non-aircraft firms—in the guided missiles field. Lockheed Aircraft Corp President Robert E Gross, speaking recently before the Institute of Aeronautical Sciences, said that airframe makers hold only nine of the 22 major military weapons-system prime contracts—covering both planes and guided missiles.

Procurement Is At Fault

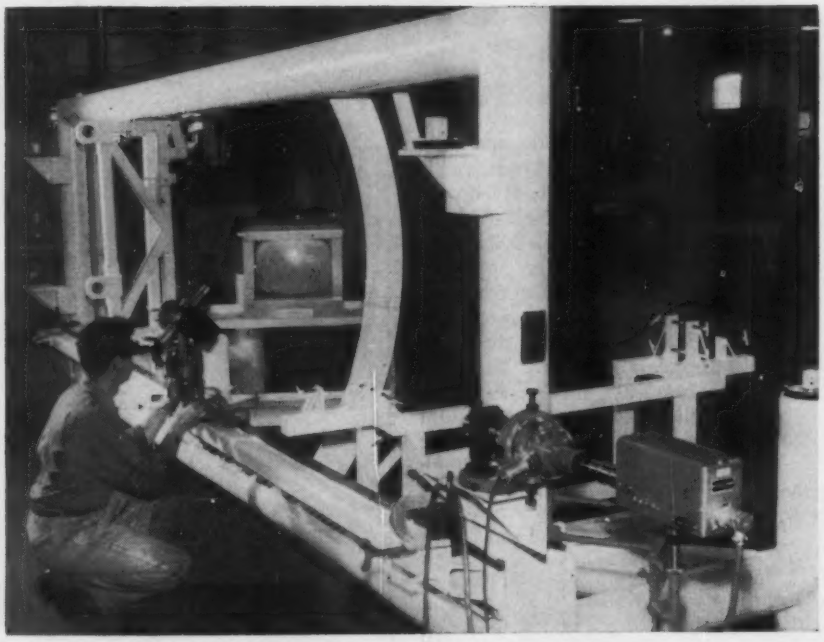
Behind these controversies is the Air Force's weapons-system concept of procurement, under which one firm gets a contract for a complete plane or guided missile, then farms out subcontracts for most of the components — radar, fire control gear, and the like.

This has been Air Force policy for at least 18 months. Previously, the Air Force itself bought the components, then shipped them—in the case of aircraft — to the airframe maker for assembly.

The new policy reflects the increasing complexity of jet aircraft production. By having one firm responsible for the overall develop-

TV-Optical Tooling Proves 300

Adjusting optical square . . .
OPERATOR GAGES ACCURACY of his optical square adjustment by watching image on TV screen in rear



of TV "eye" aimed at jig-transit eyepiece . . .
WHEN TV EYE IS AIMED THROUGH JIG TRANSIT, target etched on focal plane of the transit is projected by light beam to mirrored optical square. Through closed-circuit TV target image is enlarged 300 times

US Planes – Airframe or Electronics Firms?

ment of a plane — allowing it to coordinate and control the development and procurement of all the parts—the Air Force feels that production of complex new weapons is made simpler.

But the weapons-system concept opens the way for airframe makers to get into new fields. And that's brought the situation to a head.

How Much Subcontracting?

There's a side issue—with more general significance—to this airframe maker - electronics maker controversy. That's the general question of how much subcontracting the prime contractor should do on military business. A sore point with smaller subcontractors has been that the big airframe firms frequently pull back work into their own plants.

Say the aircraft companies: the pullback of work is simply a matter of survival for the prime contractor. In addition, suppliers' failures to meet schedules and to estimate work loads more than one year in advance make some withdrawal of work from subcontractors necessary.

The situation has been played up during the past three months because of the downswing in Air Force production schedules. Peak production levels have been passed, and there's less business to go around.

Right now, the Air Force wants the primes to stay in their own backyard. USAF officials say they have authority to enforce the policy of helping component manufacturers.

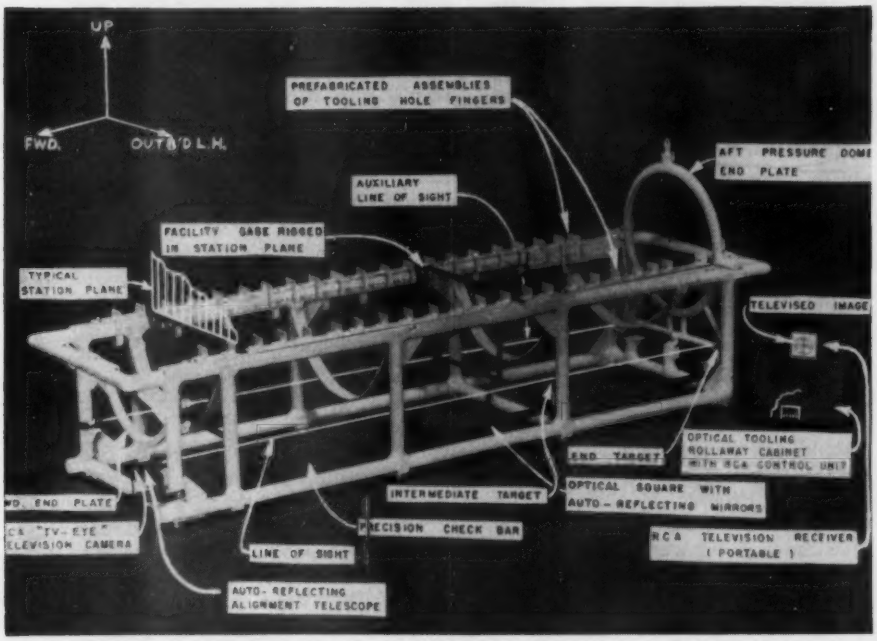
It's government policy to spread military business as much as possible among subcontractors for two reasons: (1) the politics of small business, and (2) the strategy of maintaining a broad mobilization base.

But the Pentagon won't set up a system of mandatory subcontracting for fear of weakening the weapons-system program and losing control over the primes. At the moment, therefore, they seem to be walking a tight rope.

ASME to Publish Engineering Terminology

BALTIMORE—ASME's long-awaited standard on "Industrial Engineering Terminology" is now available, it was announced at the Society's spring meeting here. The Terminology is a 50-page booklet of 500 industrial engineering terms arranged in alphabetical order and so defined as to be understandable by non-experts in the field. Subjects range from elementary definitions to an entire series of complex production terms. Included are descriptions of the flow process chart, the simo chart and the Gantt chart. Copies are available at $1.50 each from Order Department American Society of Mechanical Engineers, 29 W 39th St, NY 18.

Times as Accurate as Human Eye



is method that has changed rigging concept at Douglas

TRANSITS AND LEVELS HAVE BEEN ELIMINATED on assembly jigs for DC-7C transports, have been replaced by the closed TV circuit, optical square and indexable steel straight-edge that combine for super-accurate positioning of tooling fingers

SANTA MONICA, CALIF—Tooling accuracy 300 times that which can be achieved with human eye is claimed for Douglas Aircraft's new system of combining closed-circuit television with optical tooling. Here's how it works: telescopes and targets are used for the optical reference lines from which parts of jigs for DC-7C transports are positioned. TV camera looks into eye of telescope, picks up reference points or an auto-reflected image, and beams image to a table-type TV receiver, magnifying it 300 times. Operator watches TV screen as he adjusts the optical square, in 5 seconds instead of the usual 5 minutes, and to 0.00001-in. accuracy.

New system has eliminated need for transits and levels mounted atop the assembly jig. Now, optical square is placed at a tooling station, adjusted by TV to correct position, then is moved into another tooling station to position the next tooling finger.

SPARKING SAE'S AERONAUTIC PRODUCTION FORUM were from left: Roy T Hurley, president, Curtiss-Wright Corp; George F Chapline, VP and gen mgr, Fairchild Engine Div, Fairchild Engine & Airplane Corp; Thomas P Pike, Asst Secretary of Defense for Supply & Logistics; and Raymond P Lansing, VP, Bendix Aviation Corp. Mr Chapline is this year's Aeronautic Production Forum sponsor; Mr Lansing next year's

AERONAUTIC PRODUCTION FORUM:

Meeting Competition Through Production

Problems of plant communications, tooling, and automation for limited production are SAE panel highlights

NEW YORK—Record turnouts were recorded for the seven panel sessions of the Aeronautic Production Forum held at the Hotel McAlpin here, April 21. Sponsored by the production activity of the Society of Automotive Engineers, discussions dealt with meeting competition through more efficient production.

The uniform federal catalog system now in preparation will reduce the present 3.7 million items to about 2.7 million, T P Pike, asst secretary of defense, told the forum luncheon. The catalog will be completed by Septemper, 1956.

Government-owned machine tools have an estimated replacement value of $6 billion, Pike reported. In reporting on standardization efforts, he cited the 42 different generator sets that have been used by different branches as an example of the opportunities for simplification.

Communications Gains

L E Good, mgr of mfg in the Jet Engine Dept at General Electric stated that, except in mass production, industry can get greater gains by improving the efficiency of communications than in any other way.

The panel, after reviewing the techniques, concluded that face-to-face is the best method. It is important to clearly express yourself, taking sufficient time to be understood. Much can be gained by eliminating as many levels as possible in plant communications.

One speaker wryly recalled the experience of a factory manager who was trying to stop an unneeded report that he received regularly. It took four months to find the source of the report.

Tooling Costs

In the panel on the effect of a cost-reduction program on tooling, much of the discussion centered around the new Cincinnati Hydrospin machine. Robert Winblad, chief engineer, Process Machinery Div, Cincinnati Milling, described the machine and answered many questions about its capabilities (for the first complete report on this machine, see cover and pp 126 and 190).

In reporting on electrical discharge machining, he stated that carbide tools sharpened by the new method have shown two to three times the life of ground tools.

Tooling for limited quantity production, a discussion led by Emil Dachor of Thompson Products, requires a special toolroom, with highly skilled people. They should be immune to "bumping." The operation will gain from informal operation, with both supervisors and operators participating in planning and scheduling of jobs.

Small-Shop Automation

Application of automation in smaller shops was uppermost in the minds of those attending the automation panel. People wanted to know how to get started, how to sell top management on the capital outlays involved, what the effects would be on maintenance.

On how to get started, H R Foss, director of mfg engrg, Ford Motor Co, said that plant layout, process engineering, and work standards people (in large plants) have to work together. The objective is balanced output, not spectacular localized production from a machine or two. The small shop, he said, can duplicate these functions to a degree, but would do well to consider whether they have the skill or time to design automation devices, or whether it would be better to call in specialist companies.

F S Blackall, III, vice pres, Taft-Peirce Mfg Co, said the small plant must figure out its objectives—cost

reduction only, or cost reduction plus an improvement in quality — and assign somebody to analyze costs. Once the offenders are located, call in specialists who can provide plenty of know how and free engineering out of wide experience.

Qualifications of operators become less important in the automated shop, said Bernard Caine, process engineer, Buick Motor, but those of maintenance people go up. Two problems are to train these people, and to get management to change its notion about the relationship of indirect to direct labor for costing purposes. The ratio must go up, and besides the individual crafts must be more broadly trained than they are now. If they don't know something about the other fellows problems in repair or maintenance of automation systems, they are too prone to pass the buck when breakdowns occur.

Lawrence Mahon, industrial engrg mgr, Wright Aeronautical, said automation saves space as well as direct labor, that the best way to get started is to consider a few machines at a time, or a limited area, and success will lead to bigger programs.

Chairman of the forum this year was Alfred B Hegner, production mgr, Fairchild Engine Div, Fairchild Engine & Airplane Co. The forum followed the annual SAE Aeronautic meeting.

Crack-free Chromium Plating Process Eliminates Nickel Pre-plating Step

NEW YORK, NY—A new production plating process that deposits a non-porous chromium plate directly on steel has been developed by United Chromium, Inc. Called Unichrome Crack-Free Chromium, this process provides much better resistance to corrosion than ordinary chromium on steel. It eliminates the need for preplating with copper, nickel, or both.

Said to be one of the major plating developments since the introduction of commercial chromium plating 25 years ago, the new plate is deposited free of any structural imperfection that will allow corrosive materials to reach the underlying surface. Other properties include a low coefficient of friction, excellent adhesion, a non-galling surface, and superior ductility. As plated the deposit has a light-gray matte appearance. It can be buffed to a high luster.

Plating is done with a special chromic acid bath having automatic regulation of the catalyst concentration and at a closely maintained temperature of 150 F. Standard plating equipment and procedures are used. The bath is prepared by dissolving the proper amount of a single compound, Unichrome SRHS Compound CF-500, in water. The same compound is used for maintenance of the bath, which is said to have good throwing power. Plating speed is about the same as for ordinary chromium.

The Maytag Co, Newton, Iowa, manufacturer of home appliances, is first to use this process on a production basis and reports very satisfactory results in 15 parts, including shafts, pivots, tubing, stems, and retainers used in automatic washers and dryers. In use since February, the nine-tank automatic machine plates 0.0003 in. of c-f chrome directly on steel or solid copper in 18 to 20 min. Plating speed is slightly better than 0.0009 in./hr at a current density of 3 mp/sq in.

This production unit was recommended after extensive laboratory testing plus three months of pilot line operation. More than one year of exposure of the plated surface to 100% humidity and 120 F showed no sign of corrosion in the steel base. Good wear resistance and excellent leveling characteristics in the plate, plus simple and trouble-free process operation, were further qualifying factors.

For decorative applications requiring a high luster, it is necessary to buff. Buffing operation is similar to that for dull nickel plate.

$68 Billion Capital Spending in 1980?

NEW YORK—1955's strong capital goods spending will grow steadily to the point where it will near $68 billion a year by 1980. That's the prediction of S D Maddock, president of CIT Corp, industrial financing firm. Basing his statements on knowledge of some 90 industrial fields, he said this will happen because of natural economic growth and more efficient production to offset high labor costs.

New, Fast Die Techniques Cut Forging Lead Time

COLUMBUS, OHIO — Aircraft forging lead times can be cut as much as three-fourths with new die techniques developed here by North American Aviation's Columbus Div.

North American's new tooling technique has as its basis the casting of stable forging dies from beryllium copper and other castable metals.

Cost Cuts Up to 75%

Lead time for aircraft forgings runs anywhere from three to six months on an average—even a year or more at times. North American estimates its beryllium-copper die technique can cut this lead time to an average of 3-6 weeks. And, says North American, the casting system cuts costs as much as 75% over normal die-sinking techniques. North American cites this as an example: a set of forging dies that cost $2000 to produce by ordinary die sinking would cost only $550 when cast.

The beryllium copper casting technique can be used to forge magnesium, alloy and carbon steel, as well as magnesium. And die finish seems to improve with use, North American reports, because of a self-burnishing that takes place during forging. North American, which is now turning out production parts by this method, plans to license the process.

Boride Cutting Tools? ASTE to Investigate

DETROIT—Can borides, like tungsten carbides, be used as a cutting tool material? American Society of Tool Engineers' Research Fund plans to find out.

ASTE reasons that if tungsten carbides have made such great strides in cutting tool techniques, maybe borides, which have similar characteristics, could too. For one thing, borides are more readily available, would be cheaper. But they have their drawbacks: borides are hard, but they're brittle. This means that the No. 1 problem is to find some type of binder that will raise their impact strengths to the minimum 85-90 Rockwell A required for today's cutting tools.

EUROPE'S CARBIDE MAKERS:

The Blend of U S Techniques and Low-Cost Labor Is Profitable

The wedding of American technology to by-our-standards-cheap European labor may well serve to promote Europe's economic health and arrest the spread of communism. That's the opinion of a U S industrialist just returned from an extensive tour of Europe's carbide-making and metalworking industries

NEW YORK—American production ingenuity has earned for itself a high reputation throughout Europe, where labor is a small factor and technology and materials large ones. That's the overall impression gained by Werner Pflug of Adamas Carbide Corp, who has just returned from an extensive tour of Western European metalworking plants, where he sounded out opinions of top industrialists. Mr Pflug's tour began in Geneva, Switzerland, where he set up a new tungsten carbide plant for Marcel and Lucien Eskenazi.

Output Vs Craftsmanship

Based on these contacts, he found that the reputation for general excellence of manufactured products, which is enjoyed by many European producers, particularly in Germany, is well merited. However, American production ingenuity has earned for itself a similar reputation throughout Europe. Particularly noteworthy is the fact that, from the European standpoint, standardization and uniformity of production seem to be almost synonymous with American industry. Europeans, themselves, will contrast the difference between American production and European methodology by emphasizing the precision mass-production engineering achievements of American manufacture, while stressing the excellence of craftsmanship and custom manufacture for which Europe has long been famous.

In designing the special equipment for the new plant at Garouge, Geneva, Adamas was faced with having to adapt American methods to European facilities. All the equipment was manufactured in the US and shipped to Geneva, and its installation produced unforeseen difficulties which had to be corrected on the spot. It was this that gave Mr Pflug the opportunity of comparing the two technological methods and of observing the extraordinary extent of the European use of labor.

At one carbide plant he observed that most of the operations were not specialized. One operator might cut off stock, turn, shape, and grind. Management at this plant expressed the feeling that this is desirable because it leaves the responsibility strictly in the hands of one operator.

Buildings at this plant were good-sized and well laid out, but the laboratory facilities took up easily as much space as the factory! In talking with laboratory technicians, Mr Pflug learned that the emphasis on the use of tantalum carbide in Europe is much less than in the US. It was pointed out that cheap European labor obviates the necessity for increasing the cratering resistance of the carbide, and therefore the life of the tool, by the addition of tantalum carbide. It is obvious that the downtime involved in tool changes—a big factor here—is relatively unimportant in Europe. Lost production time for us can make the difference between profit and loss; this is not so over there.

Make More Intricate Shapes

In general, Europeans manufacture more intricate shapes than we do. However, this is probably because we have tried to simplify designs so as to use as little shaping and grinding labor as possible. They do not have to work along these lines because their labor is considerably less expensive, being about one-quarter to one-third of ours. Direct labor in Europe runs at only about 8% of the selling price; cost of materials between 21 and 24%.

At a German carbide plant, it was obvious that many more employees were used than in a similar operation in America. This was especially true in the shaping dep't where much work was done by hand, instead of by machine. For example, in the manufacture of carbide balls, even in large quantities, the procedure was extremely effective but, because of the labor involved, would be prohibitive in this country. A cylinder of preformed carbide, the length equal to the diameter, is rotated slowly by random hand movements against the mouth of a hardened steel tube with sharpened edges. Surprisingly enough, this method makes balls spherical within a tolerance of 0.005 in.

Much work was done by small diamond wheels on tool-post grinders, or rotated by a rigidly supported hand grinder, while the carbide was manipulated on a table which had movement in two directions. Generally speaking, they employ fixtures which swing or slide past a fixed power-driven wheel, instead of moving a wheel over the fixed carbide.

For surface grinding, silicon-carbide wheels were used, rather than diamond wheels. This points up that, while we will invest in materials to save labor, this is not at all appropriate in Europe.

At another German carbide plant, handwork was substituted for even less laborious techniques. Although many machines were patched and ancient, the European economic picture was again presented. Labor usage was extensive; unobtainable—or more costly—materials and machine tools were conserved. Despite this wide use of manpower, the direct labor cost at this plant runs only 7% of the selling price; the cost of materials about 20 to 22%. However, this 7% is easily matched by research expenditures in the tremendous laboratories. The lab building is probably twice as big as that which houses the actual carbide manufacturing facilities!

European carbide manufacture, then, is based on a production methodology firmly supported by laboratory research, but which is, paradoxically, actually made possible, in the first place, only by cheap hand labor.

Russia Admits Machine Output Isn't Up to Western Production

LENINGRAD — The Soviet Union just isn't keeping pace with the West in design and production of new machinery. That's no news to anyone outside the Iron Curtain. But when the statement comes from the chief technologist at Russia's Sverdlov Machine-Building Plant and is published in Pravda, official communist party organ, it's news. According to a signed article in Pravda:

● Despite a fourfold increase in Russian machine output since prewar years, machine tools and forging presses are still being used unsatisfactorily. There is a lag in developing and introducing new, economical, high-production machinery that's up to the present level of world technology.

Coordination Failure

● Russia's machine tool industry has fallen behind in developing metal-cutting machines—mainly because of failure to coordinate production processes. This lack of coordination has resulted in abortive attempts "to find methods of casting, hot stamping, and working metals by pressure in order to produce parts closer to their final form."

"Not Sympathy, But Scorn"

● Arbitrary, bureaucratic speed-up decrees do more harm than good in the machine tool industry. To quote the article: "An objective evaluation of the conditions under which technologists at many machine-building plants are forced to introduce new technological processes shows that these conditions are inconsistent with the tasks assigned to the machine-building industry. For some reason, it is now widely believed that anything new must have an immediate effect. There is no appreciation of the fact that those directly involved —the workers—need time to master innovations. Sometimes a new and progressive technological process suffers partial failure when it is first introduced. Unfortunately, this evokes not help and sympathy, but scorn."

France's Citroen and Panhard Form Auto "Entente"

PARIS—Two of France's major automakers, Citroen and Panhard, have formed an "entente" (an auto-producing agreement that to all intents and purposes is a merger). Under this long-anticipated arrangement Citroen, France's second biggest automaker, becomes a large stockholder in Panhard and will turn over manufacture of its small 2CV truck to Panhard, which will also continue to make its own Dyna truck. In return, it is assumed Panhard will get out of large car manufacture, leaving the field clear for production of Citroen's large 11 CV and 15 CV models.

Citroen thus obtains two advantages: (1) by shifting its small truck output to Panhard, it gets much-needed space at its Paris plant, and (2) it allows Citroen to cut its too-many-model output by one. In 1954, Citroen produced 154,000 vehicles—21,600 of them the 2CV truck now assigned to Panhard. Panhard produced 14,000 vehicles—over 13,000 of them the Dyna truck.

Japanese Planemakers Merge

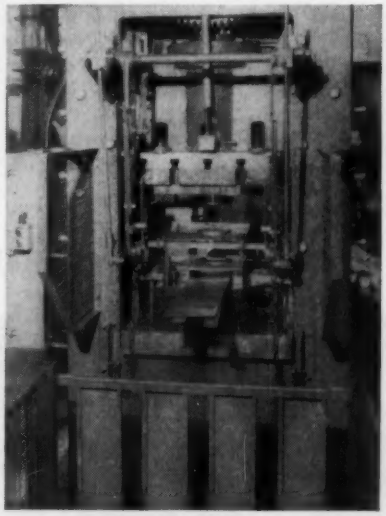
TOKYO — Six Japanese aircraft manufacturing firms, once part of Japan's huge World War II Nakajima Aircraft Co, broken up after the war by Allied Occupation authorities, have merged into a new firm to be known as the Fuji Heavy Industries Co.

The new company will mark time pending authorization for Japanese manufacture of jet trainers by devoting only a fourth of its production facilities to aircraft and aircraft parts manufacture because of low current demand for planes. Balance of production will temporarily be given over to vehicles, rolling stock and various types of machinery. Fuji Heavy Industries has 5000 employees at present.

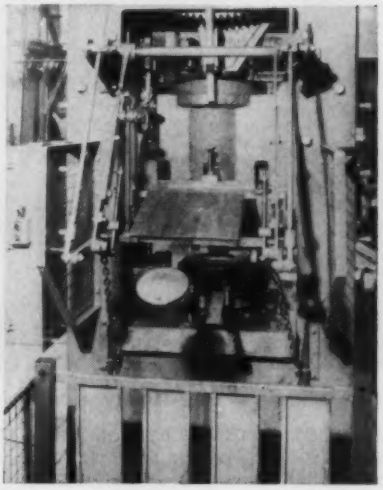
Britain's New Automated Press Unloader

BIRMINGHAM, ENGLAND—One of Britain's newest entries in the field of automation is an automatic press unloader developed by J P Udal of Birmingham, designed for use on presses with a stroke of over 6 in., at an operating rate of up to 36 strokes per minute. As illustrated below, the unloader works this way: work is ejected from upper die onto the unloader tray. Then, as the ram descends, the tray moves out horizontally, and tips to discharge the work into a tote box. Arms are adjustable to suit varying die heights, and tray unit can be replaced with a gripper unit to pick work out of the lower die.

Loading . . .



. . . and unloading



WESTINGHOUSE TOOL FORUM: Automation

Automatic gaging, spark-gap tracing and magnetic tape controls shared the spotlight with industry's hottest topic—automation vs the guaranteed annual wage—at Westinghouse's 19th Tool Electrification Forum. The consensus: automation's "not a social plague, it's an economic necessity."

BUFFALO—There was talk of automation, and talk of the guaranteed annual wage, mixed in with reports on such new machine tool developments as magnetic tape controls for automatic turret lathes, automatic gaging, spark-gap tracers for die-sinking millers, and an announcement of Westinghouse's new Cypak system of static switching circuits for industrial controls. The scene was Westinghouse's 19th Annual Machine Tool Electrification Forum, held here April 19-20 and attended by upwards of 500 engineers and operating men from machine tool, automotive, farm machinery and other Metalworking firms.

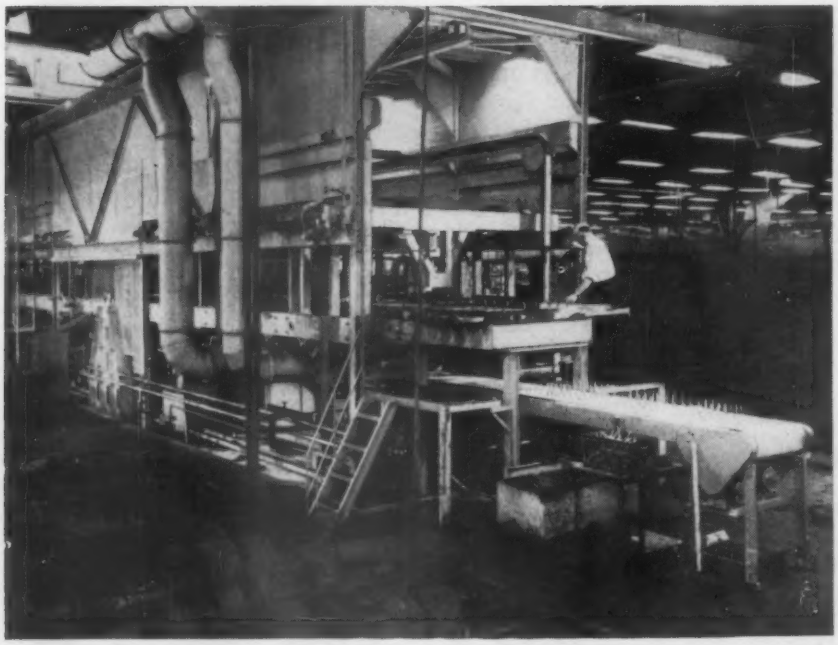
In extending greetings from the machine tool industry, M A Hollengreen, president of the National Machine Tool Builders' Association, and president of Landis Tool Co, commented on the current campaign on behalf of a guaranteed annual wage —and stated that "under our dynamic system of competition there is only one guarantee of steady employment. That is the guarantee of an annual increase in productivity, which will give the American consumer, each year, more for his dollar than he was able to get the year before."

Mr. Hollengreen also pointed out that "maximum productivity on behalf of the standard of living and the full employment opportunities of all the people" be implemented by replacement of obsolete production units.

"There are still in operation in the metalworking plants of the United States," he stated, "hundreds of thousands of antiquated, obsolete, almost worn out machine tools. These old machines represent high-cost production by comparison to the productivity per man hour that has been built into today's new models, largely by the progressive development of automatic controls."

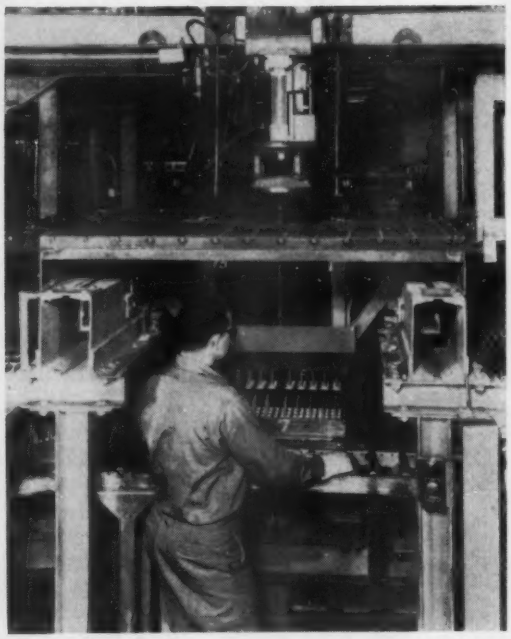
"These old machines are a drag upon the nation's economy. They act as a brake upon our cycle of perpetual progress," Mr. Hollengreen said. "The machine tool industry can guarantee the metalworking industry of the United States that

Aluminizing Line Turns Out Auto



Overall view of Alspray fluxing and cleaning line . . .

ALMOST COMPLETELY MECHANIZED is the Alspray operation at Tompson Products. Foreground is moving-belt conveyor, which carries previously sprayed valves into fluxing-cleaning furnace



from start . . .

AS VALVES ENTER fluxing-cleaning mechanism, they are automatically engaged and cycled through process

and GAW Talk Vie with Technology

if it will undertake immediately a sound and comprehensive program of replacement of obsolete machine tools, the savings effected will total over a billion dollars a year and . . . an increase in overall employment."

Tell Berna, general manager of NMTBA, told the forum that the current situation in the machine tool industry is far healthier than it was in 1950, and that the industry now can meet the demands of its customers better than ever before.

"Automation is not a social plague; it is an economic necessity," accord- to D C Burnham, vice president-manufacturing, Westinghouse Electric Corp: "We find ourselves in the rather ridiculous position of having to defend a manufacturing technique that is not only logical but absolutely essential to the growth and well being of our country.

"We must use all the manufacturing know-how we can muster," he said. "Perhaps the single biggest responsibility of the machine tool builder in helping the growth of automation is to manufacture obsolescence of other peoples' machine tools. Although most companies, like Westinghouse, have equipment replacement programs, the machine tool industry should work hard at making present day machine tools obsolete. Not only is this essential to the rapid growth of industry in general, but it is sure to benefit your industry in particular. I hope we don't have to wear out our machine tools. I hope you make them obsolete so we have to replace them."

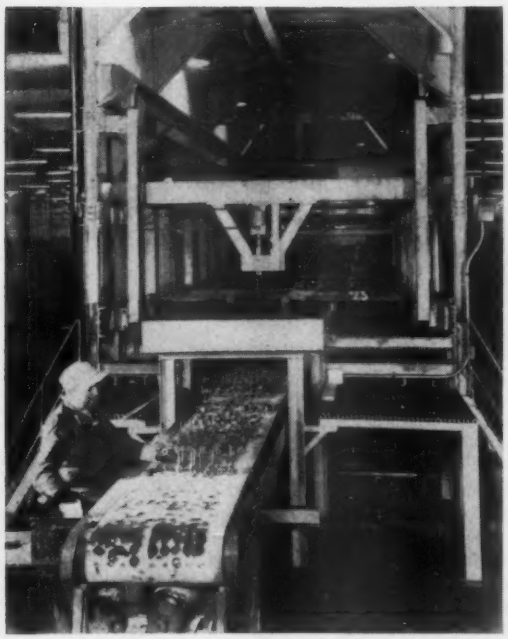
"Operation of machine tools from stored information is the promising new comer in the control systems field," according to Leonard Hesse, chief electrical engineer, Gisholt Machine Co, who described an automatic turret lathe controlled by magnetic tape, recently built and tested by his company. Since a control signal is generated regardless of whether the magnetic tape is moving or stationary, it is, according to Mr Hesse, also possible to use the system he described to correlate a group of discontinuous functions in several directions on the same or different machines.

Tracer Controls

The stylus of the new spark gap tracer control system described in a paper presented by E E Kirkman, project engineer, Pratt & Whitney Div, Niles-Bement-Pond Co, never touches the metallized surface of the model being reproduced by the die miller it controls. Instead, it traces by maintaining a constant spark gap between the model and the stylus at all times. The result is a simple tracer control which, according to Mr Kirkman, exerts zero operating force on the model, has a very high speed of response and a large output signal, and has inherent flexibility. It is particularly suitable, he said, for the duplication of intricate impressions from plaster or plastic models.

(Continued on next page)

Valves That Last 200-500% Longer



to finish

FINISHED VALVES are unloaded here for intensive inspection prior to shipment

Mechanized Line Is Joint Development Of Thompson Products and Ajax Electric

CLEVELAND—Auto valves that last 200-500% longer are being turned out here at Thompson Products Inc's Valve Division at a rate of several thousand an hour on an aluminizing line developed jointly by Thompson and Ajax Electric Co of Philadelphia. The line, completely mechanized except for two unloading operations, preheats the valves, sprays aluminum on the heads, fluxes and bonds by salt-bath immersion, water quenches and acid - and - salt - water rinses the valves. The result: valves that are exceptionally resistant to burning.

The Thompson-Ajax aluminizing method, known as the Alspray Process, is an offshoot of an aluminum coating process originally developed by General Motors Research Laboratories and used at Thompson in 1954. That process consisted of applying aluminum by dipping the valves into a fluxing bath, then immersing them in molten aluminum. Then it was found that processing costs could be cut drastically and output could be stepped up considerably if the aluminum was applied before the fluxing bath. Hence, the old Aldip Process was converted into the present Alspray Process at Thompson in late 1954.

In the Alspray line's mechanized operation, valves are sprayed after seats and stems are finished, with heads preheated by gas torches. Sprayed valves are picked up by special fixtures and automatically conveyed through the entire fluxing-cleaning cycle.

Heart of the process is an Ajax electric salt bath fluxing furnace 7 ft long, 2 ft wide and 2 ft deep, which can hold seven fixtures at a time, holding them in 1350 F molten salt for 1 minute.

TOOL FORUM (continued)

A novel, compact instrument developed by his company for accurately measuring linear feed rates of machine tool components was described by E E Opel, chief electrical engineer, National Automatic Tool Co. Compactness permits the operator to make machine adjustments while reading the meter of the instrument.

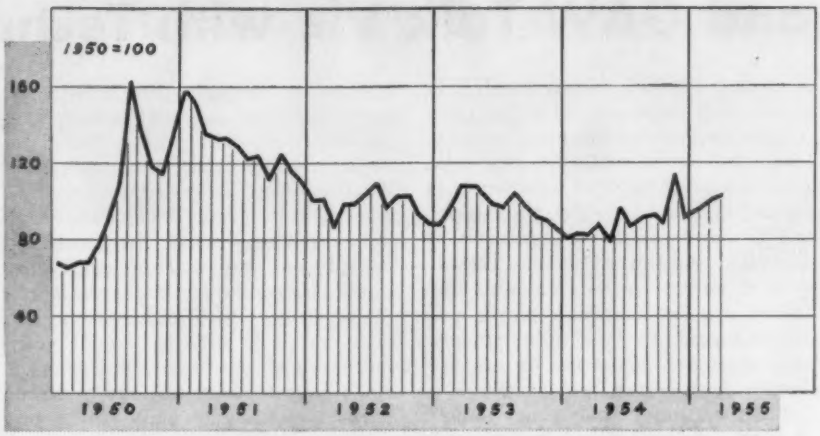
Kendall H Spencer, electrical engineer, Blanchard Machine Co, described a low-inrush control of large machine tool motors of the type used on the vertical surface grinders made by his company.

Ultrasonic impact grinding was described in detail in a paper presented by Ralph Moschella, manager, Ultrasonic Sales, Raytheon Corp. Materials successfully machined to date with this process range from ceramics and glass to quartz, ruby, sapphire, tungsten and cemented carbides. It also will cut some of the softer metals, like aluminum, brass and copper.

Automatic gaging, as currently being applied to some machine tools, can do much more than merely indicate if a part is or is not acceptable, according to a paper presented by A Wiseman, chief electrical engineer, The Sheffield Corp. Since it is a sensing device which can and does act on the information it receives, Mr Wiseman pointed out that it can, for example, determine if a machining process is under control and, if not, can initiate action to bring it under control or shut down the process until proper adjustments are made. Gage signals also can be used to count parts as they are machined, to mark size classification for later matching, to lock out succeeding operations, and to perform a number of other operations. These signals are digital in nature, rather than analog. The part is either good or bad; the tool either needs adjustment or it doesn't; there is no maybe.

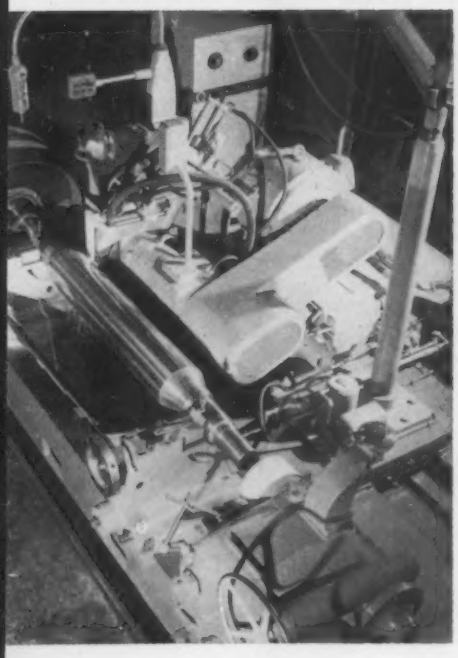
Much discussion resulted from presentation of papers on radio interference shielding of machine tools by L W Thomas, Bureau of Ships, and C D Fahrnkopf of Westinghouse. According to Mr Thomas, it is possible that increasingly stringent regulations will be issued by the Federal Communications Commission and other government agencies when better means for measuring interference are devised.

Machinery Orders Continue to Rise



McGRAW-HILL INDEX OF NEW ORDERS FOR MACHINERY for March registers 105, compared with 101 in February (1950 = 100), continuing an uptrend started in mid-December after a sharp drop from 1954's October-November peak

Kaiser Applies "Floating" Foundation to Roll Grinder . . .



. . . to protect it from plant vibration

75-TON CINCINNATI ROLL GRINDER in Kaiser's Permanente, Calif, foil plant will handle rolls up to 36-in. dia by 192 in. long. To maintain tolerances of ±0.0002 in. and finish of 1.4 mu in. rms on the long rolls, the grinder had to be protected from vibration caused by foil mills. Spring suspension of the type developed for forging hammers was employed. The 235-ton concrete foundation and grinder (total weight: 310 tons) is supported on 28 Korfund spring isolators, each containing nine coil springs. Foundation block was cast with 14 parallel steel beams, each 10 in. high, running through it. Beams are supported by springs resting on main foundation block set on bedrock

BULLARD'S 75TH ANNIVERSARY was off to a fine start with an employee open house (top right) April 17, followed by two civic days, with community leaders as guests. Customers (lower right) were welcomed, watched demonstrations all during the following week

U OF WISCONSIN's recent Human Relations Conference had a wide range of Metalworking firms represented, as evidenced by delegates' signs

Companies in the News . . .

Norton Co, Worcester, Mass, will open a new grinding wheel manufacturing plant at Santa Clara, Calif. Slated for January 1, 1956, operation, the plant will make a full line of vitrified, organic and diamond wheels.

Giant 12,000-ton extrusion press designed by **Lombard Corp** and built by **United Engineering & Foundry Co** under the Air Force Heavy Press Program, will be set up for testing at UE & F's Youngstown, Ohio, plant in June. Press is slated for operation at **Harvey Machine Co's** Torrance, Calif, plant.

Westinghouse Electric Corp has set up a new **Director Systems Dept** at Pittsburgh, to engineer, manufacture and sell specialized automatic control systems.

Elgin National Watch Co, Elgin, Ill, has purchased its second relay equipment manufacturing firm in six months—**Advance Electric & Relay Co,** Burbank, Calif, makers of precision electric relay switches. This also represents Elgin's third move into West Coast industry.

Precision Products Inc has opened an electronics components manufacturing plant at Phoenix, Ariz, will specialize in close-tolerance work, down to 0.002 in.

Temco Aircraft Corp will shortly begin construction of a $500,000, 506 x 150 ft addition to its Garland, Texas, plant.

DeGraff Industrial Corp has been formed at DeGraff, Ohio, to make precision parts for military items and industrial use.

American Machine & Metals Inc, New York, is buying **Lamb Electric Co,** Kent, Ohio, makers of fractional horsepower motors, business machines, portable tools, and automotive and aircraft components.

Eaton Mfg Co, Cleveland, has purchased **Fredric Flader Inc,** North Tonawanda, N Y, aircraft engineering and research firm, will operate it as a subsidiary.

American Brake Shoe Co has purchased the air compressor business of **Lynch Corp,** Defiance, Ohio, will discontinue Lynch's Par line of air compressors, and instead will offer Kellogg-American compressors through Par dealers.

National Diamond Laboratory has been formed at Glendale, Calif, to make special diamond form dressers, and diamond wheel dressers set in metal powder matrixes. The firm will also produce diamond hones for carbide.

Mackintosh-Hemphill Co stockholders have voted sale of that firm's assets to **E W Bliss Co.** Mackintosh-Hemphill now becomes a division of Bliss, will continue to make mill equipment.

Pioneer Engineering & Mfg Co, Detroit, has added 35,000 sq ft to its engineering and design facilities at 3437 Goldner Ave.

Chrysler's Detroit Tank Plant will go on a standby basis for Army Ordnance. The Chrysler-managed, 1-million-sq-ft plant and its 1500 production machines will become the second largest standby defense manufacturing installation in the U S. Largest: Chrysler's Michoud plant in New Orleans, on standby since March 1954.

Marion Electrical Instrument Co expects to complete a new instrument plant adjacent to Grenier Field, Manchester, N H, by July.

Hoffman Engineering Corp, Anoka, Minn, has added 10,000 sq ft to its electrical equipment manufacturing facilities.

Convair Fort Worth recently settled with Local 277 Office Employes International (AFL) for pay increases to 1200 office workers, totaling $167,000 a year.

GISHOLT MACHINE CO APPOINTMENTS: Frederick L Chapman (left), a vice president and member of the board of directors; he formerly was vice president, sales. **George M Class,** a vice president; he heretofore has been vice president, engineering. Both men now will be general officers of the company

Robert S Stevenson, executive vice president of Allis-Chalmers Manufacturing Co, Milwaukee, has been elected president to succeed the late **William A Roberts**

Names in the News . . .

Tinnerman Products Inc, Cleveland, elections: **Robert C Overstreet,** executive vice president, to president, succeeding **George J Schad,** retired; and **John E Potter,** controller, to secretary, treasurer, and member of the board.

Howard S Bunn, a vice president and director of Union Carbide & Carbon Corp, has been elected executive vice president and member of the executive committee.

Harry A Wilson, Jr, formerly associated with the Bohn Aluminum & Brass Corp, has been named vice president of H A Wilson Co, Union, NJ, manufacturer of thermostatic materials and precious metal and sintered electrical contacts.

Stewart L Wolf, formerly associated with Carborundum Co's Coated Products Division, has been named sales manager of Grinding & Polishing Machinery Corp, Indianapolis, Ind.

Nicholson File Co, Providence, RI, elects: **Stanley Livingston, Jr,** vice president operations; **Charles E Fogg,** vice president and secretary; **E Blair LeFevre,** engineering; **Bruce R Zeiser,** foreign sales; **Hugo Merk,** export manager; **B J O'Neill,** assistant secretary.

E F Norelius, consulting engineer for Allis-Chalmers at its Springfield, Ill, Works, has retired after 30 years of service with the company.

Ford Motor Co, in line with the recent establishment of separate Lincoln and Mercury divisions, has made the following appointments: **Benson Ford,** vice president and general manager of L-M, named vice president and group director of Mercury and the new Special Products Divisions; **William Clay Ford,** vice president and general manager of the Continental Division, named vice president and group director of the Lincoln and Continental Divisions; **F C Reith,** formerly managing director of Ford of France, elected vice president and general manager of Mercury; **Ben D Mills,** who will continue as assistant general manager of Continental, named vice president and general manager of Lincoln; and **R E Krafve,** assistant general manager of L-M, appointed general manager of the Special Products Division.

Edmond A Neal, domestic sales manager of Nicholson File Co, Providence, RI, has been elected vice president, domestic sales. (For other Nicholson appointments, see above.)

L K Stringham, chief engineer of Lincoln Electric Co, Cleveland, has been named vice president, engineering, to succeed **George Landis,** appointed vice president, research

Gilbert T Coovert, general manager of V & O Press Co, division of Emhart Mfg Co, Hudson, NY, has also been named general manager of Emhart's Henry & Wright Division, Hartford, Conn

WILLIAM K STAMETS CO APPOINTS: W J Smetak (left), executive vice president and treasurer of the company and its subsidiaries; and **Henry R Hanson** general sales manager of the Machine Tool Distributor Division. He also is a vice president of the company, and first vice president of the American Machine Tool Distributors' Association

John C Cotner, president and general manager of Hydraulic Press Manufacturing Co, Mount Gilead, Ohio, has resigned as executive head of the company. Mr Cotner, who will continue as a director of the firm, has been treasurer of the National Machine Tool Builders' Association since 1953.

Lincoln Electric Co, Cleveland, appoints: **Norman J Hoenie** chief engineer, Machine Division, and **Emmett Smith** chief engineer, Electrode Division. Both men have been serving as assistant chief engineers of their respective divisions.

James A Arter, associated since 1937 with Ampco Metal, Inc, Milwaukee, Wis, in various managerial capacities, has been appointed vice president in charge of manufacturing.

General Walter Bedell Smith, vice chairman of American Machine & Foundry Co's board of directors, has been named chairman of the board and president of AMF Atomics Inc, a newly-formed subsidiary. **Arthur V Peterson,** formerly director of the Atomic Energy Department of AMF's Engineering Division, has been appointed vice president for operations.

L B Mytinger, associated with machine tool sales for the past eight years, has been appointed sales manager of Turchan Follower Machine Co, Detroit

Lester A Edwards, associated since 1937 with Cincinnati Gear Co in production and sales capacities, has been appointed assistant sales manager.

Bruce G Miller, sales manager of Metal Cutting Tools Inc, Rockford, Ill, has been appointed vice president and general manager. **Ray E Ambrose,** sales engineer, succeeds Mr Miller.

Western Gear, Lynwood, Calif, elections: **Bernard J Bannan,** general manager of the company's six plants, to vice president, operations; **L A Myhre,** assistant general manager in charge of marketing, to vice president, marketing; and **Paul Mehren,** controller, to secretary-controller.

Joseph J Becka, superintendent of Barth Corp's (Cleveland) Special Machine Division, has been appointed superintendent of the new Brookpark Road plant.

Norman L Deuble has been named manager of the newly-created metallurgical development division of Climax Molybdenum Co.

J H Williams & Co, Buffalo, NY, manufacturer of industrial and automotive wrenches, tools, and drop-forgings, has appointed: **Marshall H Durston,** formerly Pittsburgh and West Virginia area representative, to represent the company in Michigan; he takes over the territory covered by **Dale Bethke,** now assigned to Chicago; **John W Murray** has been named sales representative in Western Pennsylvania, West Virginia, Southeast Ohio, and Northeast Kentucky.

Paul E Beatie has been appointed vice president and general manager of O & M Machine Co, Los Angeles manufacturer of precision machine products for aircraft.

Cummins Engine Co, Columbus, Ind, promotions: **E D Tull,** named executive vice president; **C R Boll,** vice president, sales; **R B Stoner,** vice president, personnel; **P J Every,** general sales manager.

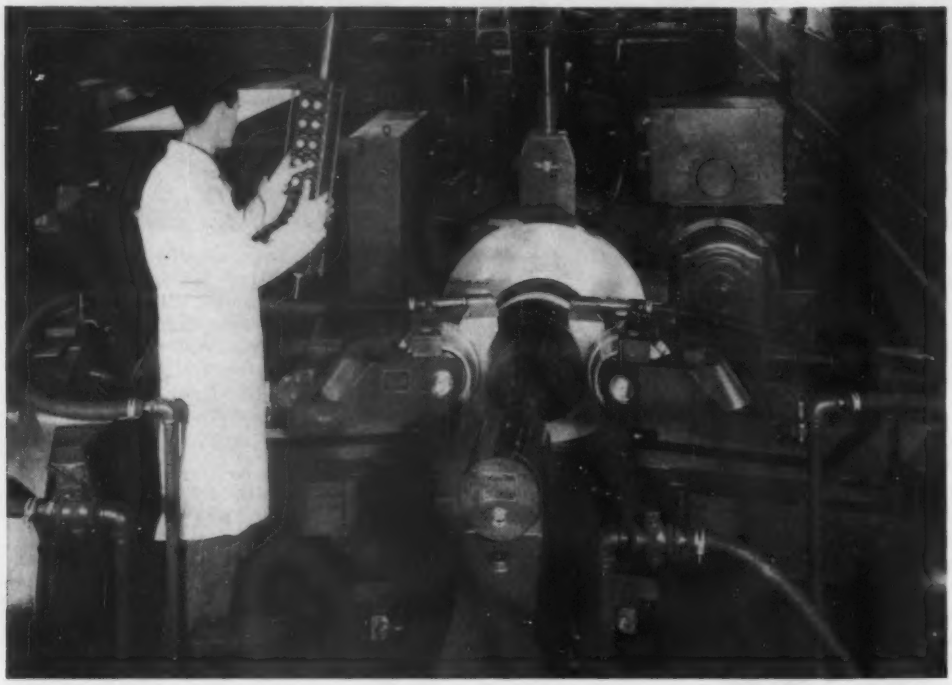
Richard F Harrington has been appointed chief development engineer of Aetna Ball & Roller Bearing Co, a division of Parkersburg-Aetna Corp, Chicago.

R K Pond, industrial engineer for Westinghouse Electric Corp's elevator division plant, has been named superintendent of the production department, **H R Scholp,** staff supervisor of industrial engineering, succeeds Mr Pond.

J F Hutchinson has been promoted to manager of automotive engineering of Goodyear Tire & Rubber Co's Metal Products Division. He succeeds **J C Tuttle,** named consulting engineer. **G C Huffman** has been promoted to the post of superintendent of the company's Metal Products Division.

OBITUARY

K C Gardner, 78, chairman of the board of United Engineering & Foundry Co, and its chief executive officer, died April 15 in Pittsburgh, Pa.



HYDROSPIN MACHINE has welded steel bed designed to support rigidly the headstock, tailstock and roller slide assemblies. Each of the two slide units can be positioned to suit jobs. With auxiliary equipment, machine requires 24 x 19 ft of floorspace

HYDRAULIC CONTOUR TRACING, turning and mandrel grinding attachments, and carriers for end-mounted rollers, are available

Cincinnati Hydrospin Uses High Pressure

Hollow cones and cylinders of regular contour up to 42-in. max OD and up to 50 in. long can be cold-spun from flat disks, preformed blanks or rings of almost any ductile metal with the Cincinnati 42 x 50-in. Hydrospin machine. Driven by a 20- to 50-hp infinitely adjustable-speed motor, depending on application requirements, machine has two independently controlled, hydraulically actuated roller carriers which can be traversed simultaneously or independently as required by the spinning operation.

Having capacity to force the roller against the workpiece with extreme pressure, each roll carrier can be traversed up to 54 in. along its main slideways, and has a 10-in. power crossfeed stroke. Roll pressure available is sufficient to roll-form a ¾-in. thick flat disk of AISI 4130 steel down to a 60° included-angle straight-wall cone, or to roll-form AISI 4130 steel tubes with ½-in. wall down through 60% reduction in one pass. Unit pressures may run as high as 300,000 to 400,000 psi.

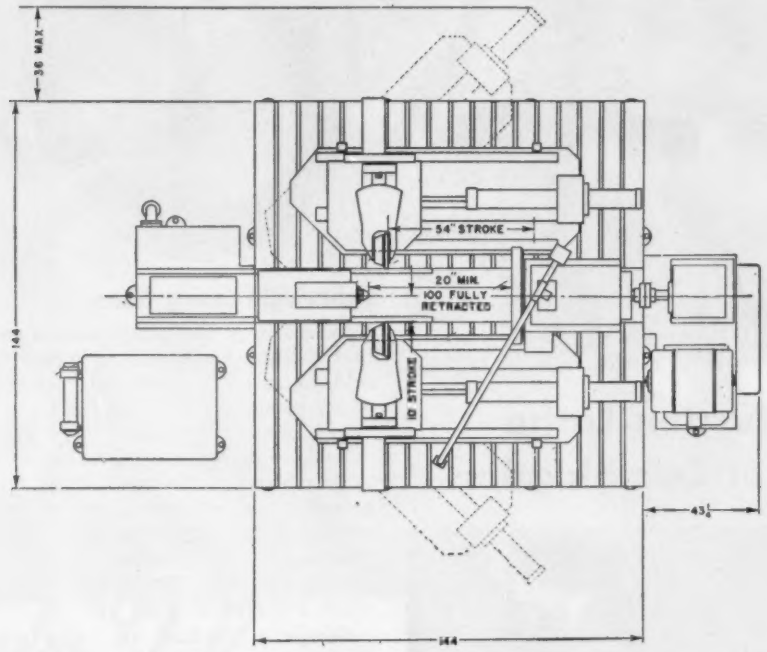
Main slides which support roll carriers may be placed in any position on the flat, 12-ft-square, T-slotted welded-steel bed. Using opposed rollers' slides may be placed parallel with each other, on opposite sides, so tubes up to 42-in. OD may be roll-formed. Cones of any included angle may be roll-formed by placing each slide at half the included angle to the headstock-tailstock centerline, or if design of the workpiece permits, one slide may be positioned to perform one operation and the other for a subsequent operation during the same setup. For dishing or beading disk-shaped parts, the front slide may be removed and the rear slide positioned perpendicular to the centerline. Hydraulic contour-tracing attachments, with templet mounts, can be fitted to either or both roll carriers.

Movement of saddles, cross slides and tailstock may be controlled manually, with pushbuttons, or may be connected for automatic cycles, with the position of each unit controlled by precision limit switches. The headstock spindle has an automatic start-stop control which also may be interlocked with automatic cycle controls.

The heavy tailstock, which may be moved within 20 in. of the faceplate, and retracted 100 in. to permit removal of 50-in. long workpieces, serves both to hold the workpiece and mandrel "on center" during spinning, and to hold the blank tightly against the end of the mandrel.

Faceplate is 36 in. OD, and is drilled and tapped for mandrel-mounting bolts. It is supported by a heavy-duty spindle carried in high-capacity precision radial and thrust bearings. The headstock may have supplementary outboard faceplate bearing supports to withstand high peripheral loading. There are two spindle speed ranges: low rpm range

Materials and Parts . . .



COOLING AND LUBRICATION of workpiece and rollers is essential for almost all cold Hydrospinning operations. Machine has 40-gpm system for flooding high-specific-heat coolant, like Cimcool, over work area throughout spinning cycle. Where unit pressures are high, as when spinning stronger metals, paste lubricants are used

to Roll-Form Cones and Tubes

for grinding and turning, and a high rpm range for spinning.

Two hydraulic circuits are provided. A hydraulic pump driven by a 7½-hp motor provides hydraulic power for longitudinal feed of roll-carrier saddles along the main slides. Longitudinal feed rates provided by this system are infinitely adjustable between 0 and 60 ipm when only one slide is operating, and 0 and 30 ipm when both slides are in use. Return rates are 135 ipm when using one slide, 67 ipm when using both slides.

Hydraulic power for cross slides and the pilot system is provided by a second pump driven by a 7½-hp motor. Cross-slide feed rates are 0 to 54 ipm when one slide is operating; 0 to 27 ipm when using both slides. Cross slides return at 60 ipm with one slide; at 30 ipm with two slides. A heat exchanger controls oil temperature in the 100-gal reservoir serving both hydraulic systems.

Each roller carrier supports a roller, a set of roller bearings, and a 14-in.-OD, hardened-tool-steel tool ring. Removal of a roller to change a tool ring does not disturb the setting of the roller bearings. Two swivel-mounted roller carriers are supplied. In addition, a swivel-type roller carrier designed for use with end mounted rollers is available for internal upsetting and flanging operations where there is no clearance.

Attachments Available

Also available are turning and mandrel grinding attachments. The turning attachment permits turning, facing, and cutoff operations without removing the workpiece from the mandrel. Forming mandrels can be finished in place on the faceplate with the grinding attachment, which is equipped with the Filmatic spindle bearings used in Cincinnati cylindrical and centerless grinders.

Process Machinery Division, The Cincinnati Milling Machine Co, 4701 Marburg Ave, Cincinnati 9, Ohio

. . . including

MACHINE TOOLS AND ATTACHMENTS

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Toolroom Lathe ..... page 194
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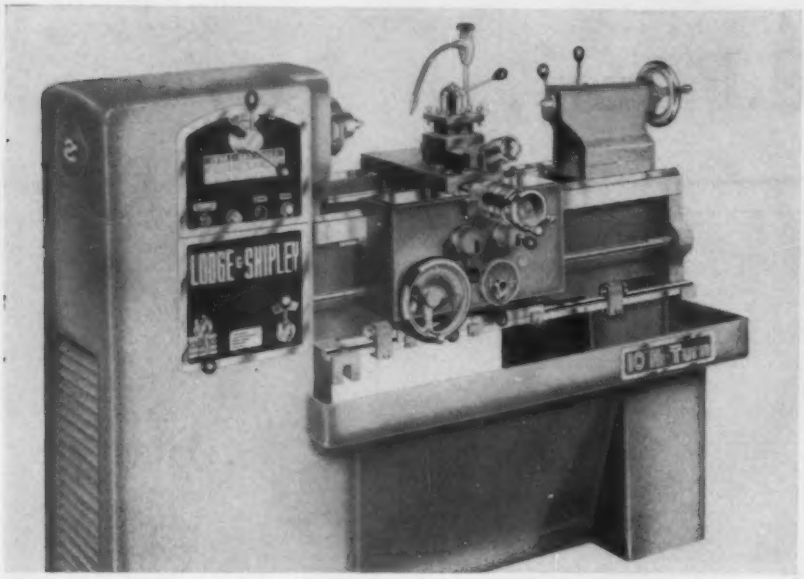


Lodge & Shipley Production Lathe Has New Speed, Power Combination

The new 10-in. Hi-Turn lathe was specifically designed for production operations, offers 5 hp and speeds to 3000 rpm in heavy-duty geared head. Design eliminates the leadscrew, using a feed rod to provide turning, boring, and facing operations. The redesigned headstock incorporates totally enclosed quick-change gearbox. Built in is a four-way tool block and there is provision for rear tool block and multiple tool operation. The dual direct-reading micrometer cross-feed dials read to 0.001 in. on dia. Tailstock spindle is hardened and ground; length stops are templet type, operating automatically.

All nine feeds and speeds are color coded, selections made with two levers. Standard range is 136 to 2000 rpm; intermediate, 170 to 2500 rpm; high range, 202 to 3000 rpm. Drive motor, with dynamic brake, is in the leg.

The nine feeds provided by the gearbox range from 0.0015 to 0.024 ipr. Splash lubrication is sealed in. Travel of the carriage (which has hardened and ground cross slideways) is indicated on micrometer in 0.005-in. graduations.

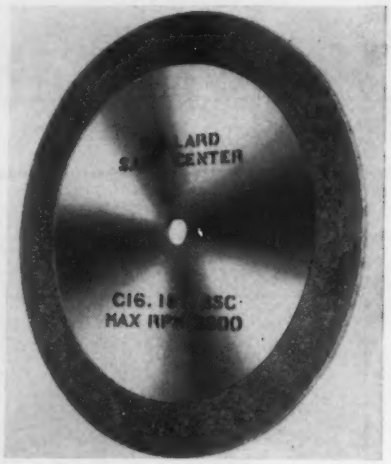
Lathe has three-point mounting which eliminates the need for special foundation. Base, pan, legs, and coolant sump are integrally cast. Base is designed for easy chip removal. Bed is separately cast and bolted to base, fitted with eliptical girths and L&S replaceable flame-hardened steel bedways.

The Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio

Magnetic Particle Inspection Kits

The SempuN magnetic flaw detector used in England for several vears is now available here. Weighing 11 lb and requiring no electric current source, the unit is a permanent magnet with unique ball pivots and multi-self-adjusting magnetic pins. Unit is supplied complete with check test piece, re-magnetizing leads and plastic spray bottles containing inspection medium — iron oxide, powder, or ink. The check test piece is designed with surface flaws and sub-surface flaws of various depths. Re-energizing is accomplished by flashing the system, using the leads furnished across a 12 or 6-volt battery. A portable de-magnetizer is also available for use on critical parts.

Rice-Peterson Sales, Inc, Box 111½, Palo Alto, Calif

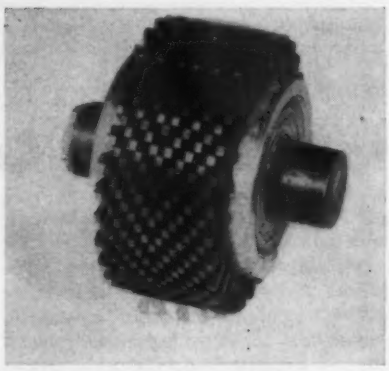


Lightweight Coping Wheel

Elimination of the heavy steel plate in the Safe-Center coping wheel is said to result in 50% less weight while retaining the strength of the heavy steel center type.

Because of the special wheel construction as a single unit, cutting rim becomes an integral part of the wheel, increasing safety, and providing two full inches of usable cutting material. Wheel is discarded when completely worn out.

George H Bullard Co, Westboro, Mass



Mechanical Wheel Dresser

Precision ball-bearing mechanical wheel dresser is said to have 30% more width than similar units available.

Features include 2⅝-in. OD; seventeen 16-gage cutter disks; 29 teeth per cutter, with full ⅜-in. tooth length; larger diameter shafts for added rigidity. According to the manufacturer, 10-15 micro finishes can be obtained, and units can, in many instances, be used in place of a diamond.

Three types of spindle models are available with same features for any grinding application.

Aer-O-Matic Tool Co, 5059 W Diversey, Chicago, Ill

On the back of each color TV viewing screen are more than one million phosphor dots (19" screen) grouped in uniform patterns of red, green and blue. Electron beams registered with each dot are shot at these phosphors—the intensity determining the dominating color.

Directly behind the screen in each tube is a Cupro Nickel shadow mask containing more than 400,000 holes. Each hole is registered exactly with its group of phosphor dots on the screen and with the electron beam—the mask controls the register of color—keeps the image sharp —the color true.

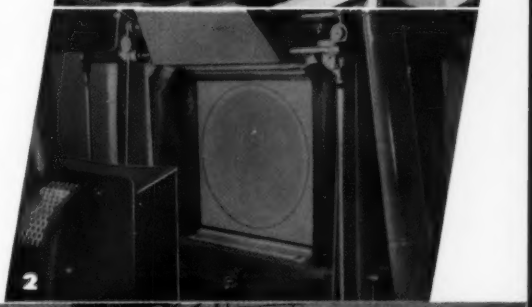
Color TV came to ANACONDA

When the television industry needed a shadow mask to control electron beams in the color tube, Buckbee Mears Company, photoengravers of St. Paul, Minnesota, produced it. When they needed thin strip metal in which 2500 perfect holes per square inch could be etched, Anaconda produced it.

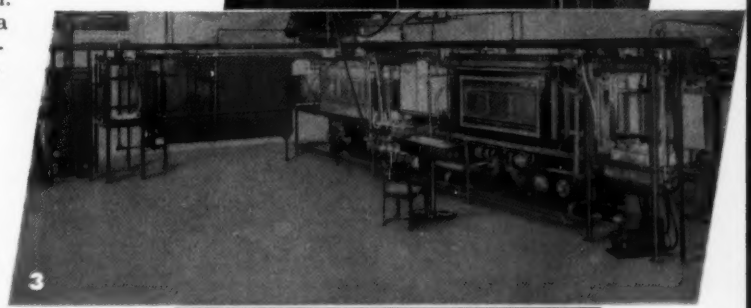
When color TV came to Anaconda, we developed a new alloy, 6% Cupro Nickel, with such uniform quality, structure and thickness (0.0075") that the microscopic holes could be etched without flaw. The new alloy also has the strength and malleability to take forming without distortion of the dot structure, and functions in a color tube without contaminating the vacuum.

Again, a copper alloy has solved a difficult problem. Perhaps yours can be made easier through Anaconda research and development. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ontario.

1 Rolls of the Cupro Nickel strip entering coating machine to be sensitized for photographic printing.



2 Camera printing dot pattern on the sensitized Cupro Nickel strip.



3 Printed Cupro Nickel strip at right entering etching machine where acid baths plus washing and rinsing operations produce finished mask.

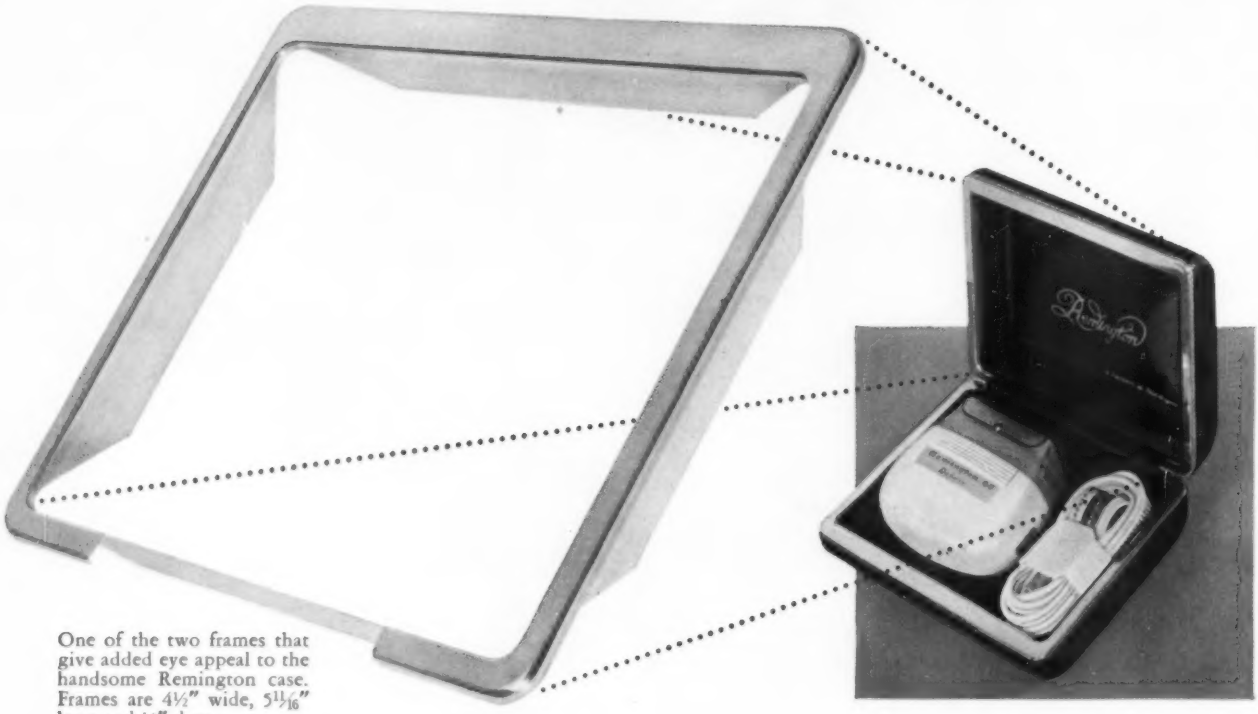
4 Each 19" shadow mask has more than 400,000 holes, size .010±.0005. Several areas of screen are inspected electronically to check hole size.

ANACONDA the name to remember in

COPPER • BRASS • BRONZE

Rejects dropped from 11% to 1%

when Farrington switched to Formbrite for frames of Remington Shaver case



One of the two frames that give added eye appeal to the handsome Remington case. Frames are 4½" wide, 5 11/16" long and ½" deep.

Formbrite* fine-grain drawing brass is harder, stronger, springier...often polishes in half the time

Press operator blanks frames for the Remington case out of 6" x .0126" Formbrite drawing brass strip.

Each day, thousands of these brass frames for the Remington-60 Deluxe Shaver case are made by Farrington Manufacturing Company of Boston. Using ordinary brass, rejects *after polishing* were running at the rate of 11%.

Then Farrington switched to Formbrite. Rejects dropped immediately to less than 1% . . . and with far less polishing Farrington now gets the best finish they've ever seen. And that's important because the Remington case helps sell the shaver.

You'll find Formbrite surprisingly ductile . . . it's readily stamped, formed, drawn and embossed. Yet with all its advantages, it costs no more than ordinary drawing brass. We'd like you to know this cost-saving metal better. May we send you descriptive literature (ask for booklet B-39)? A free sample to try in your own shop? Or have a representative call? Simply write to *The American Brass Company, General Offices, Waterbury 20, Conn.* In Canada: *Anaconda American Brass Ltd., New Toronto, Ontario.* *Reg. U. S. Pat. Off 8577

Frames are set in fixture for finishing operation on this automatic, three-station polishing machine. Bright, lustrous finish is obtained in one pass through the machine.

Formbrite

FINE-GRAIN DRAWING BRASS

AN ANACONDA® PRODUCT

made by The American Brass Company

FYI
FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 GEARED HEAD LATHE—*Sheldon Machine Co, Chicago 41, Ill.* 4-page circular describes Sebastian 15-in. unit. Design features illustrated; specifications, attachments and accessories listed.

2 GEAR SHAVING MACHINE—*National Broach & Machine Co, Detroit 13, Mich.* 8-page brochure illustrates automatic Red Ring Model GCI available in different sizes for gears from 3/16ths to 220 in. PD. Operational details described, specifications of four sizes given.

3 CENTERS—*Ready Tool Co, Bridgeport 8, Conn.* Booklet illustrates line of Red-E anti-friction, high-speed, carbide-tipped centers. Also includes data on grinder and milling machine dogs, basic bearing designs, interchangeable points for shank centers, extra heavy duty bull nose and air foil centers.

4 SHELL MOLDING SYSTEM—*Link Belt Co, Chicago 1, Ill.* 8-page illustrated booklet No. 2462 describes automatic system for producing up to 240 molds per hr. Includes 4-station shell molding machine, shell closing machine, and all process equipment from sand preparation to handling of finished castings.

5 SWISS MACHINE TOOLS—*Carl Hirshmann Co, Manhasset, NY.* 8-page folder contains illustrated information on Hauser jig borers, Tornos automatic screw machine, Nassovia die sinker, and others.

6 TUBE BENDER—*Parker Appliance Co, Tube & Hose Fitting Div, Cleveland 12, Ohio.* 8-page catalog 1141A10 illustrates and describes Model 824 bench-mounted manual unit equipped with new toggle clamp for speedier operation. Specifications, parts list, operating instructions included.

7 METALWORKING MACHINES—*Kling Brothers Engineering Works, Chicago 51, Ill.* 6-page illustrated bulletin 100 covers complete line of basic models representing 50 different machines for 20 fabricating operations. Includes construction features and condensed specification charts.

TOOLS AND ACCESSORIES

8 GROUND THREAD TAPS—*Pratt & Whitney, Div Niles-Bement-Pond Co, West Hartford 1, Conn.* 26-page illustrated bulletin T-583 contains section on standards revision, conversion and general dimension tables, description, recommendations, specifications, and thread limit tables.

9 OPTICAL ELEMENT—*Eastman Kodak Co, Special Products Sales Div, Rochester 4, NY.* 23-page booklet describes the Axicon and its application to alignment problems. The element is a glass cone used in a telescope. Line drawings illustrate operation details; typical setup discussed

10 STEEL-CUTTING CARBIDES—*Allegheny Ludlum Steel Corp, Carmet Div, Detroit 20, Mich.* 4-page illustrated catalog C-11 describes Series CA-600 incorporating an anti-cratering ingredient, Crystalloy. Applications and case histories included.

11 LUBRICANT—*Alpha Corp, Stamford, Conn.* Field Report No. 141 on use of Molykote for highly loaded threaded connections. Detailed description of comparison tests between Type G, a concentrated MoS_2 paste, and other thread lubricants at room and elevated temperatures.

12 GAGES—*Eastern Precision Gage Co, Elizabeth 2, NJ.* 16-page catalog contains illustrated data on line of plug, ring, and carbide gages. Sizes and prices in tabular form.

13 THREAD-REPAIR PACK—*Heli-Coil Corp, Danbury, Conn.* Bulletin 724 describes "Shop Pack" containing wire thread inserts, tap, and inserting tool for repair in larger sizes. Illustrates three-step operation. Lists insert sizes and prices, and variety of applications.

14 UNIVERSAL PROJECTOR—*Stocker & Yale, Marblehead, Mass.* 4-page bulletin describes Model 10; accessories illustrated; specifications and price list included.

15 WORKHOLDERS—*Lassy Tool Co, Plainville, Conn.* 4-page circular on multi-purpose Model P2, a basic jig for variety of applications with standard accessories. Setups illustrated, specifications and prices given.

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16 ABRASIVE WHEEL—*C R Vogt & Co, Moline Ill.* Circular illustrates applications of All-Four model for grinding, sanding, polishing, and deburring on metal, plastic, wood, and rubber.

17 STANDARD TOOLS & BLANKS—*Adamas Carbide Corp, Kenilworth, NJ.* 16-page illustrated price and specifications book covers complete line, including throw-away insert blanks, each size in two thicknesses. Contains tabular carbide grade recommendations.

18 SUBLAND TOOLS—*Detroit Reamer & Tool Co, Detroit 34, Mich.* 6-page bulletin illustrates and describes uses and comparative advantages over standard and step drills.

19 HI-SHEAR TOOL CATALOG—*Hi-Shear Rivet Tool Co, Los Angeles 45, Calif.* 26-page seventh edition contains illustrated information on complete line. Includes operational data on riveting, punch-out, and Hi-torque bolt tools.

20 WORKHOLDING EQUIPMENT—*Jergens Tool Specialty Co, Cleveland, Ohio.* 60-page illustrated general catalog 101 contains engineering data on complete line of jig and fixture components and workholding assemblies. Detailed specifications and ordering system included.

HEAT TREATING AND WELDING

21 FLAMATIC HARDENING MACHINES—*Cincinnati Milling Machine Co, Cincinnati 9, Ohio.* 21-page catalog M-1861 contains illustrated information on method of hardening, brazing, and heat-processing with electronic control. Machines pictured, as well as typical applications.

22 ELECTRIC OVENS & FURNACES—*Blue M Electric Co, Blue Island, Ill.* 4-page bulletin 5510 illustrates Power-O-Matic units with automatic electronic controller. Specifications, operational, construction features on batch ovens, air draw furnaces, box-type muffle furnaces, high-temp recirculating ovens, self-contained portable electronic temp control unit.

23 STAINLESS STEEL BRAZING ALLOY—*Wall Colmonoy Corp, Stainless Processing Div, Detroit 8, Mich.* 4-page catalog describes properties and applications of Nicrobraz. Typical curves chart shear strength, ductility, tensile strength as brazed, and after aging, as compared with copper, S-590 stainless base metal, and a high-temp silver brazing alloy.

24 HEAT TREATMENT OF STEEL—*Leeds & Northrup Co, Philadelphia 44, Pa.* 20-page catalog TD-620(1) describes Homocarb method with Microcarb atmosphere control. Descriptions and specifications of furnaces and control equipment. Includes case histories and installation pictures.

PLANT SERVICE EQUIPMENT

25 PLASTIC COATING — *Eastman Chemical Products, Kingsport, Tenn.* 12-page booklet contains illustrated information on butyrate peelable plastic packaging for protection of metal parts against corrosion, impact, abrasion, and temperature. Application methods described and advantages outlined.

26 ELECTRIC TRUCK—*Yale & Towne Manufacturing Co, Philadelphia 15, Pa.* Brochures describe specifications and operational details of Model K-46 electric, stand-up, hydraulic lift truck. Bulletins 5111, 5112, 5113 cover the 2000, 3000, and 4000-lb capacity models; all three available in 68, 83, and 90-in. over-all heights with telescopic lifts up to 100, 130, and 144 in. respectively.

27 VITREOUS ENAMEL ON ALUMINUM CASTINGS—*Vitreous Engineering, Monarch Aluminum Manufacturing Co, Cleveland 2, Ohio.* Brochure lists advantages as an abrasion-resistant protective coating as well as a colorful finish; technical data and test results detailed.

28 DIRECT-FLOW PUMP — *Aldrich Pump Co, Allentown, Pa.* 4-page illustrated data sheet 63 covers design, operation, and advantages of Powr-Pac 2½-in. stroke units for application in both liquid transfer and central hydraulic systems. Specifications, applications included.

29 PAINT & VARNISH STRIPPER—*Octagon Process Inc, Staten Island, NY.* Fact sheet gives applications for Octastrip 31 for use on all metals. Strips epons and most organic coatings; nonflammable; used cold; water-rinsable.

30 STEEL SHELVING — *Frick-Gallagher Manufacturing Co, Wellston, Ohio.* 4-page catalog 701 describes Klipbilt boltless shelving erected without use of any tools. Illustrates three types of clips used for all installation.

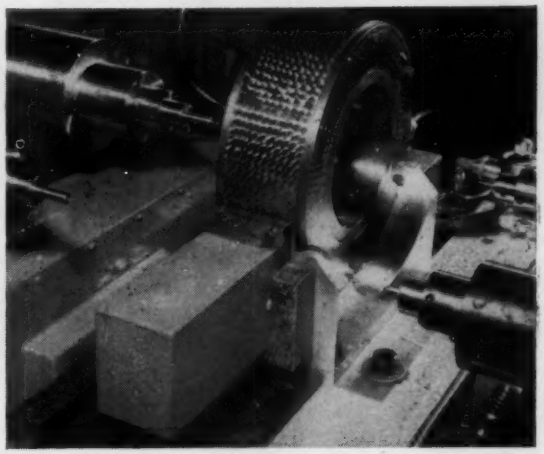
31 ELECTRIC LIFT TRUCK—*Barrett-Cravens Co, Northbrook, Ill.* 4-page bulletin 551-1 contains illustrated data on the Power Ox with a standard 6-in. lift. Specifications and features listed of walking type truck, available in 4000 and 6000-lb capacities, with wide range of platform lengths.

32 DIESEL ENGINES—*Ingersoll-Rand, New York 4, NY.* 20-page illustrated bulletin, Form 10,040, describes features of Types S and SS heavy-duty units in sizes from 375 to 1000 hp. Construction details, specifications, and dimensions of models with exceptionally low fuel consumption through use of diametrically opposed single orifice injector nozzles which provide solid fuel injection.

33 ABRASIVE WHEELS—*Weldon Roberts Rubber Co, Brightboy Industrial Div, Newark 7, NJ.* 12-page catalog 58 illustrates and describes properties and uses of Brightboy rods, blocks, disks, and wheels for deburring, finishing, and polishing metals. Operational instructions, selection of proper binder, grain size and type, specifications included.

34 NOISE—*Mine Safety Appliances Co, Pittsburgh 8, Pa.* 16-page booklet discusses problem of industrial noise and its effect on hearing. Covers methods of combating noise fatigue and damage. Illustrates and describes several protective devices.

1926
AMERICAN MACHINIST, New York Not good after July 9, 1958



AUTOMATIC BORER (left) consists of standard Excello machine with built-in controls, circuitry, tape reader, and manual controls housed in cabinet on left. Punched tape is fed through reader and electrical impulses regulate hydraulic cross-slide and rotary motion of special holding fixture (above).

Honeywell Builds Tape Control For Boring Machine

The punched-tape principle of automatic operation has been applied to a precision boring machine used in the production of instrument gear trains. System worked out by Honeywell includes standard four-spindle Excello machine modified with built-in electronic controls and circuitry and a tape reader housed in specially built control cabinet.

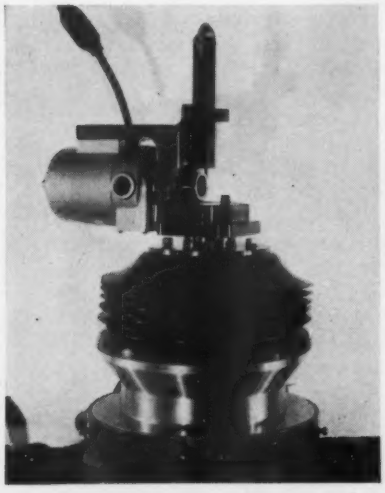
Hold co-ordinates and feed instructions are punched on tape by perforating machine similar to typewriter. Electronic signals from tape regulate linear travel of machine's hydraulic cross-slide and rotary motion of special holding fixture mounted on the cross-slide.

To set up automatic operation, proper adaptor ring is attached to rotary fixture, cutting tools are mounted in the four spindles, and the punched tape is placed in the reader of the control circuit. After inserting blank piece, operator presses button to initiate automatic cycle. Machine is adaptable to wide variety of hold sizes and patterns.

Different piece parts can be handled by changing adaptor ring and inserting appropriate tape. Where a small number of special plates is needed, machine can be manually operated by adjusting ten knobs to control linear travel of cross slide and rotary motion of holding fixture.

In either manual or tape-controlled operation, coordinate information is fed to the machine in increments of 0.0001 in. over the 8-in. range and 0.01 degrees over the 360° range. Accuracy is reported better than plus or minus 0.0005 in.

Minneapolis–Honeywell Regulator Co, Minneapolis, Minn



Slot Grinder Attachment

Enclosed contours including sharp corners, key slots, and other forms, can be ground on No. 2 Moore jig grinder with a horizontal-spindle slot grinder attachment. It can be substituted for the vertical-spindle grinding head to perform these operations.

Although the horizontal spindle axis is nominally normal to the travel of the outfeed slide, its rotatable mounting premits any other desired angular relationship. A slide, integral with the mounting element of the attachment provides for axial adjustment of the wheel position so that it can be set radial to, or offset from, the main spindle axis. This adjustment is necessary in centralizing angles dressed on the wheel face, and for dressing a wheel to grind a slot central in the bore of the hole. Attachment is motor and V-belt driven and takes unmounted wheels from ⅞ to 1 ½-in. dia. Spindle speeds range from 18,000 to 22,000 rpm.

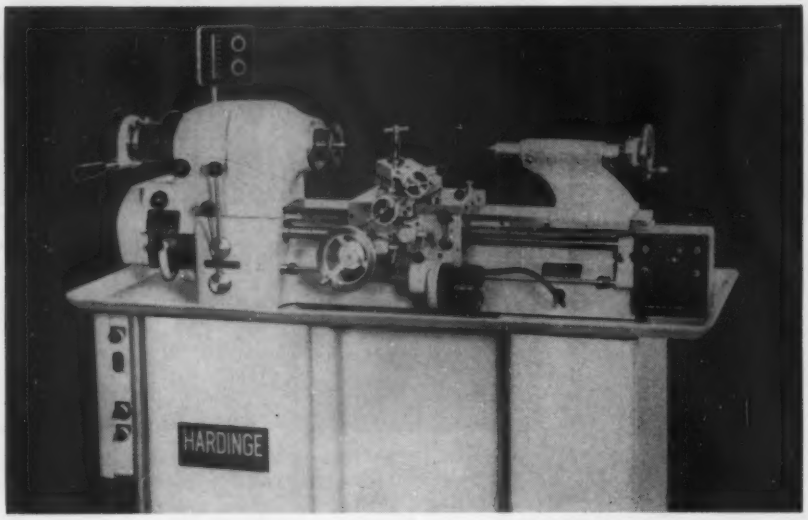
Moore Special Tool Co, Inc, 740 Union Ave, Bridgeport 7, Conn

Preis-Panto Engraving Machine Incorporates New Features

Model UE-3 engraving machine has an increased number of pantograph reductions—pantographs graduated in tenths from 1.7 to 1 up to 3 to 1, a total of 21 sizes. All bearing seats and other critical parts are precision honed. A large 26-in.-long interchangeable and removable copy table and a 26-in. long single slide which can now be attached to 18-in. copy holder permits removal of entire table for copy changes, removal of lines for copy changes, setting of combination of sizes.

For higher efficiency when using tungsten carbide cutters, spindle speeds have been increased to 15,000 rpm. Machine lamp with five adjustable knuckle joints is furnished as part accessory equipment.

H P Preis Engraving Co, 16 Industrial Branch, Hillside, NJ



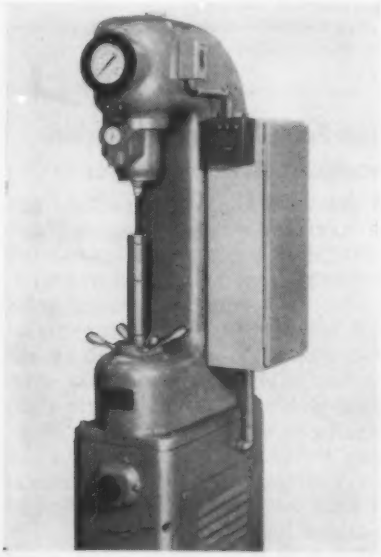
Hardinge Lathe Has Independent Variable Speed and Feed Control

Pushbutton infinite spindle speed control and independent electric carriage and cross-slide are offered in Hardinge model HLV high-speed precision toolroom and production lathe. Spindle speeds are controlled from box located over redesigned headstock and provide any speed between 125 and 3000 rpm by pressing "faster" or "slower" button. Exact spindle speed is indicated.

A lever-operated collet closer provides fast collet regulation and instantly adjustable collet tension. A built-in spindle handwheel is incorporated.

The fully enclosed headstock has 1-1/16-in. collet capacity with Hardinge 5 C collet. The preloaded ball bearing spindle eliminates all end and radial play and is permanently lubricated to operate continuously at all speeds without attention.

Hardinge Brothers, Inc, Elmira, NY



Brinell Hardness Tester Uses Colored Lights

Three colored lights which signal the relative Brinell hardness of the test piece make decisions of acceptability or rejection for testing machine. When tied in with automatic means of handling parts, unit will physically sort work after testing, thereby making possible automatic testing.

Yellow indicates too hard, green designates within range, and red shows too soft. Limits are adjustable to suit requirements of particular job.

Basically machine is same as Models KDR-6 and KDR-10. A dial indicator with adjustable electric contacts has been substituted for standard indicator previously used. To set up for completely automatic operation, the same circuits which operate operate lights can activate solenoid valves, switches, or other electrical equipment to physically sort the parts. An additional material-handling means must also be provided, with the machine cycle to be started by micro-switches, when part is properly located on the anvil.

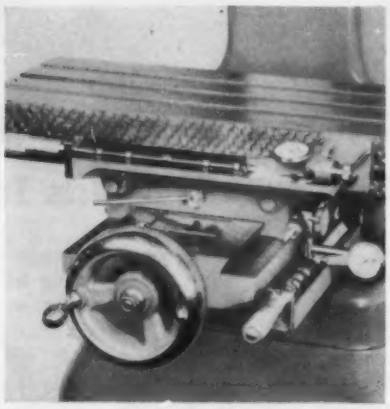
Model KDR-6E has 6-in. throat depth; model KDR-10E has 10-in. throat depth. Both have 14-in. maximum vertical opening.

Steel City Testing Machines, Inc, 8817 Lyndon Ave, Detroit 38, Mich

Precision Tool Kits

A line of precision tools, eventually to include over 20 kits, now comprises 14 items termed "DOIT URSLF." These include: toolmaker's vise; magnetic parallels in variety of lengths and laminations; magnetic V-blocks; 5-in. sine bar, and V-blocks and clamps. Bakelite and fiber, as well as brass, are used as laminating material in the magnetic tools. Each kit contains all materials necessary to complete the tool, plus easy-to-follow drawings.

S J Williams Precision Tool Kits, Inc, 4448 So Line Lane, Schiller Park, Ill



End Measuring Rod Equipment Added to Linley Jig Borer

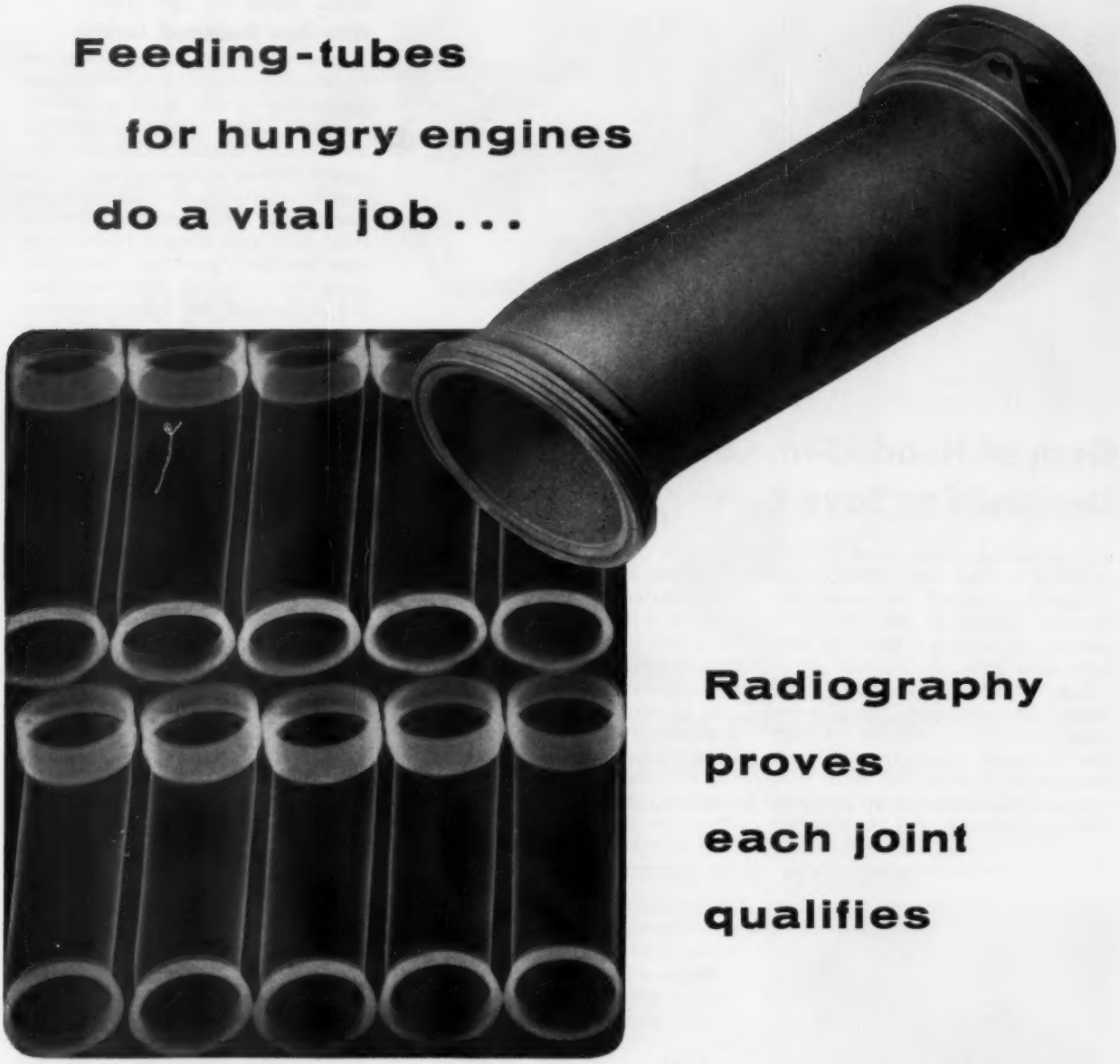
New type of end measuring rod equipment consists of two troughs, two permanently mounted one-inch micrometer heads, two "tenths" indicators, nine end-measuring rods in even inches and necessary adjusting bracket with adjusting screws. The two 1-in. micrometer heads are permanently attached to one end of each trough. Micrometer heads are of large-diameter type having thimbles graduated in half thousandths, and barrels in tenths.

The indicators are also of standard make. The 1¼-in. dials are graduated in 0.0001 in. with 0.008-in. range for very accurate settings. To eliminate possibility of internal indicator error, all settings are made to zero only, and graduations used to arrive at the zero. With this setup the spotting, drilling, and rough-boring operations are done in conventional way by use of screws, using handwheel dial readings. The new end measure system is used in finish boring operations only.

Other improvements in the jig borer are the widening of the saddle way from 5¼ to 7⅜ in. and the addition of a pin-type spindle lock.

Linley Bros Co, 682 State St Extension, Bridgeport 1, Conn

Feeding-tubes for hungry engines do a vital job . . .



Radiography proves each joint qualifies

GETTING the food and drink to the several thousand "metal horses" in a modern aircraft engine is no job to be taken lightly. Dependability is paramount. Safety a must. And lightness a prerequisite.

Joining these vital feed lines is a job for welding and brazing. And with radiography to prove each joint sound, there can be no dispute as to the acceptability of the work.

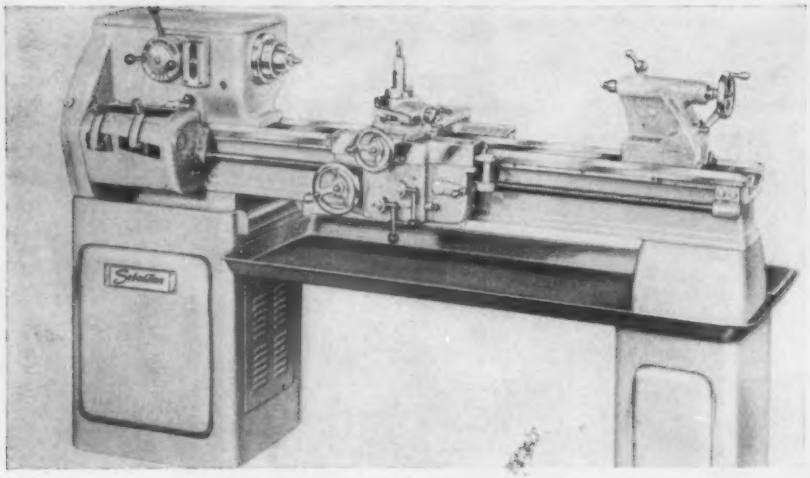
Here again, radiography has greatly extended the fields where welding can be used. It can bring you new business, too. To explore what radiography can do for you, get in touch with your x-ray dealer and talk it over.

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N.Y.

Radiography

. . . another important example of Photography at Work

Kodak



Geared-Head 15-in. Lathe Designed to Save Cost

The Sebastian geared-head lathe is reported to have been functionally designed to permit cost-saving operation. Individual test sheets reporting 19 accuracy tests are sent with each lathe.

The anti-friction-bearing headstock uses zero-precision tapered roller bearings to support the spindle. Tailstock clamp is cam-action. Spindle is thick-walled with multiple splines. Long tapered key drive nose is standard. All controls are centrally grouped for convenience.

All gears in the headstock run in oil. Gearbox provides 60 feeds and pitches. Leadscrew reverse lever is built into the gearbox. Two friction disk clutches in large apron provide power longitudinal and cross feeds, can be engaged simultaneously or independently. Built-in one-shot oil lubrication system services all bearing surfaces.

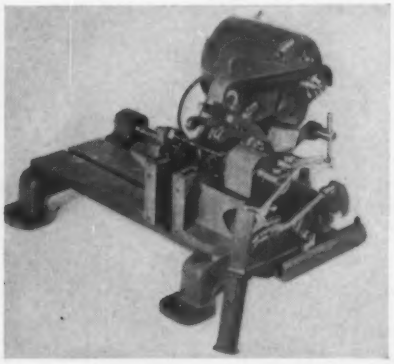
Sheldon Machine Co, Inc, 4258 N Knox Ave, Chicago 41, Ill

Wider Range of Operations With New Cemented Carbide

A new cemented carbide designed for a wider range of steel machining operations than any previously available single grade is reported by Wesson Metal. Designated as Grade 26 and created primarily to handle steel rough-and-semi-finish machining, light, medium and heavy-duty, it is also proving effective on some finishing operations. Wesson reports that although additional tests are still under way indications now are that the new grade will produce significant increases in tool life (as high as 40%) over approximately 80% of the steel machining range. Optimum performance extends from 100 to about 400 sfm. With regard to machining high-temperature alloys, it is reported that Grade 26 is not the complete answer, but that it will tend to increase tool life in machining many of these materials.

Wesson states that much of its Grade 26's performance is due to its superior cutting edge strength. Typical example of performance is as follows: A 30% increase in tool life on a severe interrupted roughing cut on a tractor brake band anchor. Standard Wesson band-type multicut tool was used on a 4A Warner & Swasey turret lathe. Cutting speed ranging from 280 sfm down to zero with feed 0.027 in. and ⅛-in. depth of cut.

Wesson Metal Corp, Lexington, Ky



Centering Machine Maintains Concentricity Within 0.0003 in.

Compact, portable, bench-mounted centering machine holds cylindrical work concentricity to within 0.0003 in., and is said to accurately maintain drill center depth tolerances of 0.002 in.

Unit centers, drills, spot-faces, chamfers, and pin-points pieces up to 1 in. in dia, of any length. It reportedly eliminates distortion of ends, flaring, and minimizes tool breakage, since work is rotated up to speeds of 15,000 rpm while tool remains stationary. In addition, it permits finishing external diameter before centering or drilling the ends.

Machine can produce centers at rate of 800 per hr. By operating a single, synchronized, cam-actuating lever, work is locked into position, tool fed into it, and predetermined supply of lubrication oil automatically fed to tool.

Central Engineering Co, 930 Erie St, Racine, Wis

Nylon Molding Compound By Allied Chemical

Plaskon nylon 8200, a caprolactam-type, reportedly offers new possibilities to molders and extruders. Properties announced are: high tensile strength, excellent abrasion resistance, light weight, self-lubricating properties, good resistance to chemicals, high heat resistance, and excellent impact strength and toughness. Typical applications include: gears, bearings, bushings, wire jacketing, and cable coating, valves, instrument housings, and coil forms.

Barret Divison, Allied Chemical & Dye Corp, 42 Rector St, New York, NY

Magnetic Coolant Separators

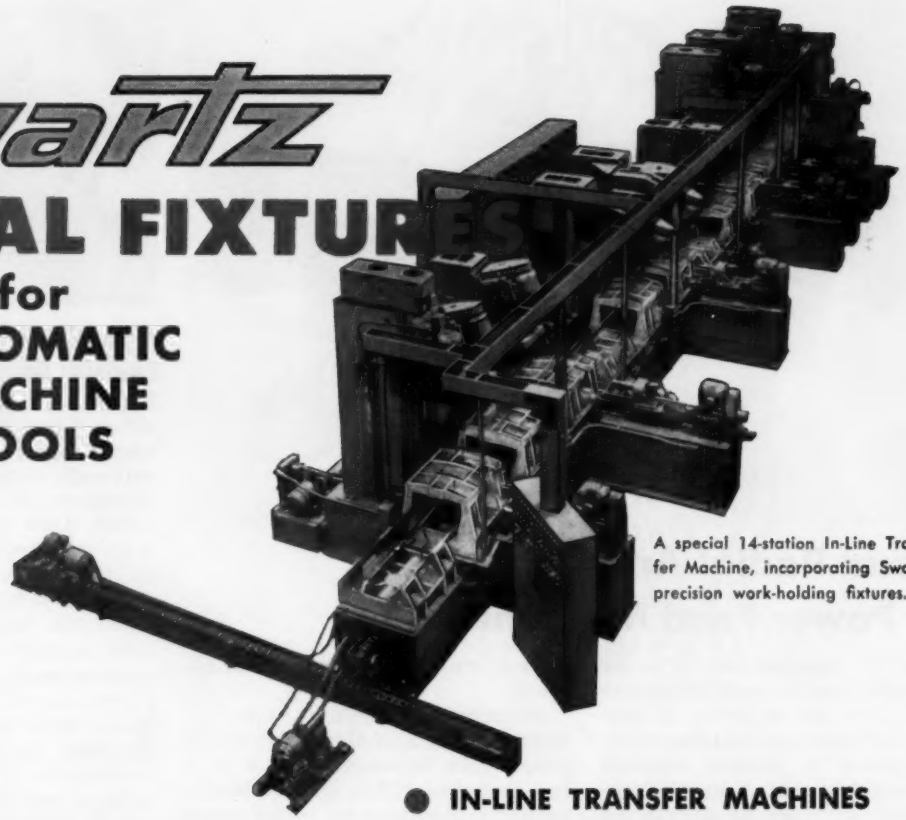
Delpark-Dings magnetic coolant separators can be used for honing, lapping, grinding, shaving, broaching, milling, metal roll-forming mills, glass polishing operations, and oil reclaiming processes.

Units may be used independently where partial separation is adequate, or for prefiltration separation to reduce load on filter. Available in capacities to 100 gpm.

Industrial Filtration Co, Dept D-287, Lebanon, Ind

Swartz

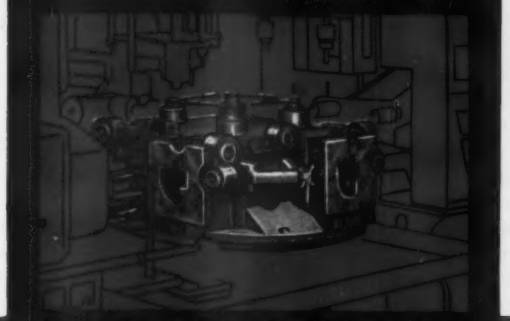
SPECIAL FIXTURES for AUTOMATIC MACHINE TOOLS



A special 14-station In-Line Transfer Machine, incorporating Swartz precision work-holding fixtures.

- **IN-LINE TRANSFER MACHINES**
- **ROTARY INDEX MACHINES**
- **TRUNNION INDEX MACHINES**
- **SINGLE-STATION MULTIPLE-OPERATION MACHINES**

Station No. 1—Special 14-station In-Line Transfer Machine. Swartz fixtures were specified for dependable, on-the-job fixture performance.



Here is a 4-station Rotary Index Machine, equipped with Swartz fixtures. Swartz fixtures were specified for maximum service and dependability.

There are many advantages in specifying Swartz precision work-holding fixtures . . . advantages which are shared alike by both buyer and builder of automatic machine tools.

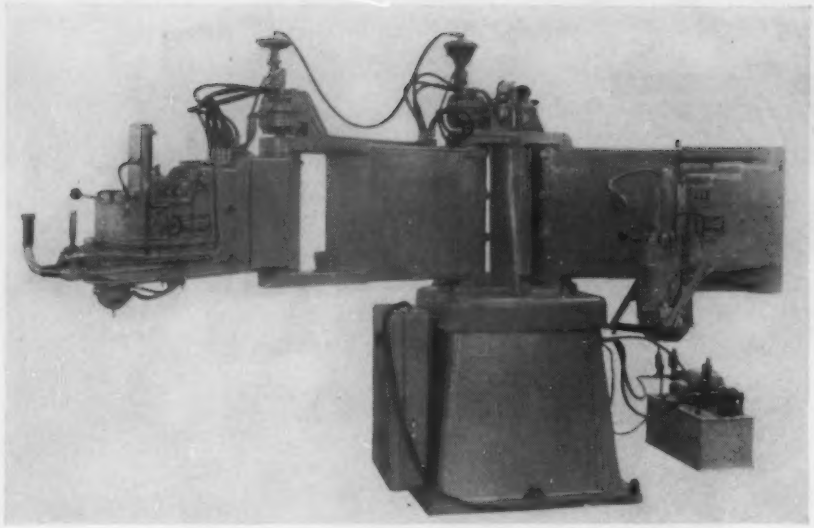
Of particular importance, is the seasoned experience, and specialized know-how which Swartz has gained through more than 30 years of fixture-building service to the machine tool industry. This experience and skill, together with the modern facilities needed to do the job, make Swartz service *complete* . . . from part print to finished fixture!

There are other advantages, too, in specifying and using Swartz fixtures. It will pay you to get the facts! A Swartz engineer will be glad to discuss your fixture requirements, and point out the many ways Swartz service can work for you *profitably*.

Write Today **Swartz service is outlined in this interesting new brochure, "Advancing Automation." A copy will be mailed on request.**

SWARTZ TOOL PRODUCTS
Division of Jefferson Corporation
13334 FOLEY STREET • DETROIT 27, MICHIGAN

Designers and Builders of: Pump Jigs • Standard Fixtures • Fixture Locks • Special Fixtures for Automatic Machine Tools.



Onsrud Radial Arm Router Has Power Feed Mechanism

Onsrud has incorporated a power feed mechanism into their radial arm routers. The power assist is controlled by operator, applying motivating power in desired direction by moving lever that way. Hydraulic motors are used at each pivot point, activated by hydraulic valve which controls the rotation of the pivot shafts. Control returns to normal on release, but operator keeps head in contact with form bar at all times.

Other improvements are: arm segments now made of aluminum; motor slide stroke increased from 4 to 6 in.; improved lifting control mechanism for cutting units; cutter motor increased from 5 to 8 hp; and use of Norgren Micro lubrication.

Onsrud Machine Works, Inc, 3900 W Palmer St, Chicago 47, Ill

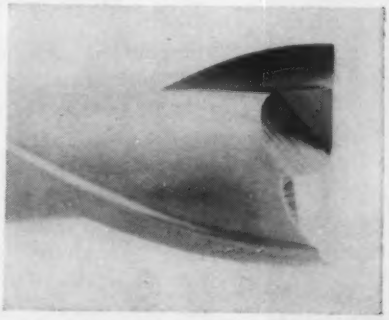
All-Silicone-Rubber Insulation For Large Motors, Generators

The use of Silastic, the silicone rubber made by Dow Corning, together with new procedures developed by Allis-Chalmers for insulating form-wound stator coils, has resulted in first all-silicone-rubber insulation system. This gives large motors and generators greater overload protection and reliability, plus maximum resistance to moisture, shock, and vibration, and to both mechanical and electrical fatigue.

Silastic is made from pure silicone rubber gum compounded with Dow Corning silica. As a filler for silicone rubber, it is said to impart maximum strength and tear resistance and to contribute to a combination of electrical properties which approach those of quartz.

Allis-Chalmers applies this Silastic to the entire coil structure and then vulcanization forms a homogeneous void-free dielectric barrier. Dielectric strength remains practically constant from 0 to 250 C. Dielectric life is reported superior to that of any conventional insulating material.

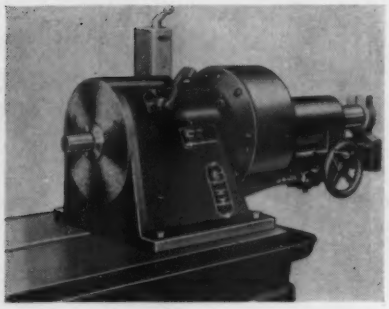
Dow Corning Corp, Midland, Mich



Wadell Process Produces Micro-Formed End Mills

End mills are ground from solid on Micro Formatic grinding machines designed and developed by Wadell. They automatically grind the end mills to uniformity reportedly never attained prior to this development. The hook, relief, and heel are ground simultaneously with a grinding action which produces lines in one direction. All surfaces of end mills have smooth finishes said to measure in lowest range of micro inch readings. The company is presently completing its inventory of all sizes up to 1-in. dia.

Wadell Tools, Box 97, Raritan, NJ



Automatic Units Do Precision Boring

Hydro-Borer Co. has announced a series of precision boring units engineered for semi-automatic and fully-automatic work control. These Series N units can be set for rapid approach within 0.015 in. of piece at which point standard Hydro-Borer hydraulic feed automatically takes over and bores at 0.004 ipr. When it completes this stage, machine automatically repeats cycle or returns, depending on setting.

Features of the series N units include: electronically-controlled, air-actuated, automatic rapid travel mechanism with adjustable controls; solenoid-actuated automatic trip and spindle return mechanism; and Meehanite front and rear bearings under constant pressure lubrication. The spindle is Nitraloy.

There is a feed of 0.004 ipr reduceable to 0.002 ipr when extra fine finish is required. Feed principle of Hydro-Boring consists of Acme-threaded piston mounted on drive spindle,—assembly rotates within oil-filled cylinder. As assembly rotates oil is displaced through threads of piston and oil displacement from one end of chamber to other feeds the boring head into work.

Standard models are equipped with ¾-hp., 220/440-volt, 3-phase 50-60 cycle electric motor with flat-ribbed belt drive and 4-step pulley for 450, 885, 1395 or 2000-rpm drive. Units are available in 12 models all table mounted. Special models can be engineered to meet particular boring requirements.

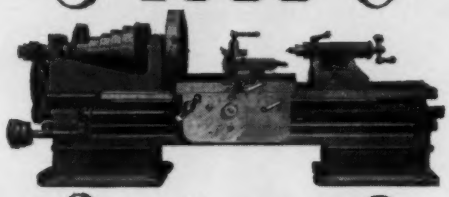
Special accessories include: concentric spindle for applications using gun-drill; hollow draw-bar for pumping lubricant through tool holder; two T-slots in table top to accommodate half-inch bolts; choice of electric motors from ¾ hp. 1800 rpm to 1½-hp. Vari-Drive for change of speeds within 10 to 1 radio. Unit can also be equipped with special spindle diameters ranging from 15/16 to 2½ in.

Hydro-Borer Co, 1601 East Olympic Blvd, Los Angeles 21, Calif

8305

IN

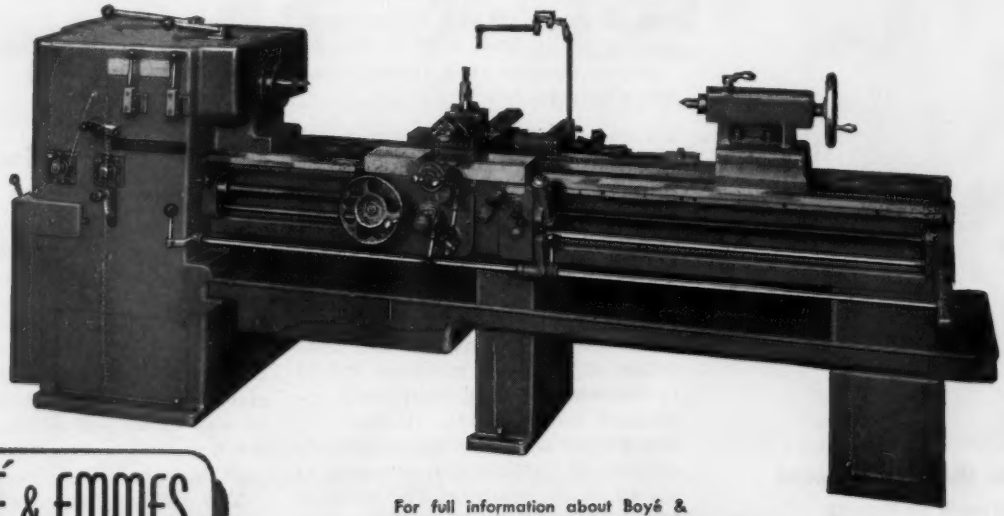
1895



BOYÉ & EMMES LONG LIFE ENGINE LATHES *looked like this!*

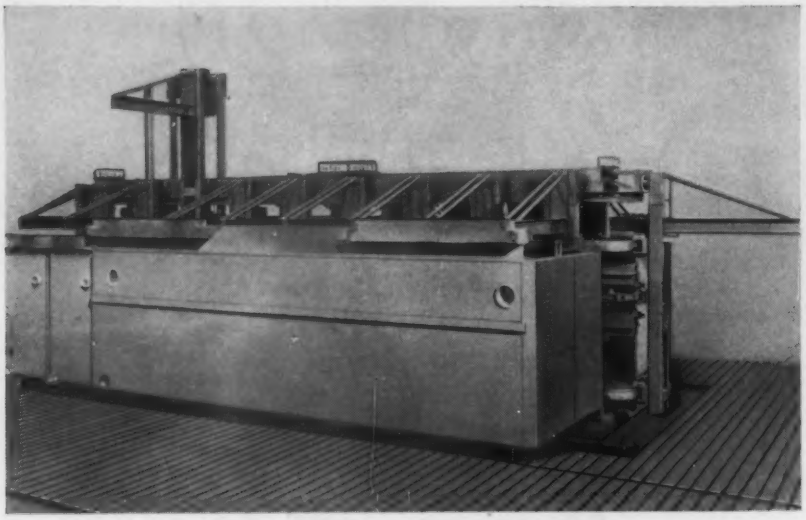
...In that year the Boyé & Emmes design featured a single back gear, which doubled the number of spindle speeds previously considered adequate.

Today **BOYÉ & EMMES LONG LIFE ENGINE LATHES** incorporate the accumulated know-how of fifty-nine consecutive years of exclusive engine lathe manufacture.



BOYÉ & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO
MACHINE TOOL CENTER of the WORLD

For full information about Boyé & Emmes extended range of spindle speeds and other modern design changes write for FREE Bulletin 5305. Ask also for our new folder "Fifty-Nine Years of Engine Lathe Evolution."



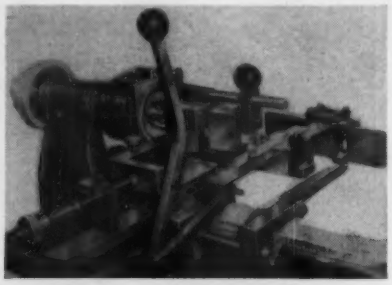
Automatic Heavy-Duty Machine Does Single- or Double-Row Processing

The Stevadoer plating and processing machine is a side-arm type engineered to enable automatic loading and unloading. It can be adapted to single- or double-row plating and processing and was designed to handle almost unlimited rack sizes. The delayed set-down mechanism, providing independent timing in one or more racks, can be installed. Through the use of a special timer control, a carrier arm can be made to skip any particular tank as desired.

A 20-in. catwalk can be provided between processing tanks and mechanism on double-row machines. No moving mechanism is over the solutions and all internal mechanisms are built below tank level.

All lift and horizontal motion of the machine is accomplished by hydraulic power. Special controls permit independent adjustment of acceleration and transfer speeds to accommodate all extremes of weight and rack size.

Frederic B Stevens, Inc, Detroit 16, Mich

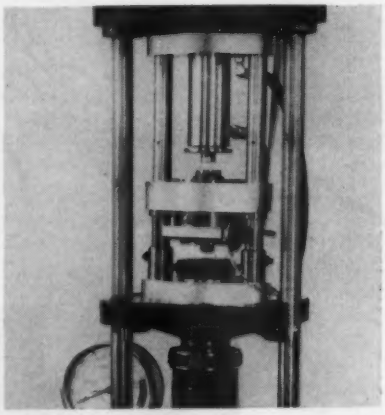


Turnomat Lathe Attachment For Precision Duplicating

Profile-tracer lathe attachment for short run production performs centerless turning, precision duplicate turning, facing, fluting, and reeding operations on aluminum, steel, brass, plastic, and wood.

Unit reportedly can duplicate any number of pieces with extreme precision. Templets are cut from blank aluminum stock with ordinary shears. Once cut, it is bolted to the unit and tracing mechanism duplicates exact pattern on stock. Templets can be reused any number of times.

Turnomat Co, Brockport 50, NY

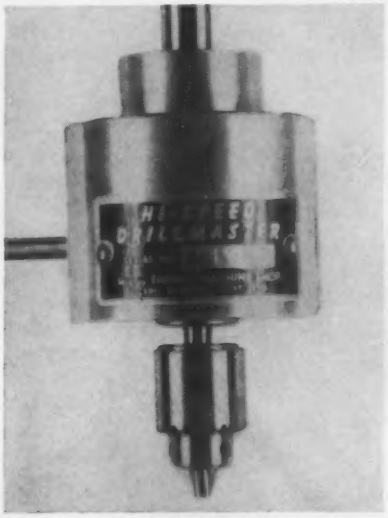


Press Conversion Device Allows Plastic Molding

Through use of plastic molding conversion device, standard hydraulic presses, laboratory size or larger, can now be utilized for injection transfer or extrusion plastic molding. Unit is self-contained and can be moved into and out of press instantly and operated without changing press. It was developed for experimental work as well as to handle small production runs.

The pressure ram can be operated directly from the plant pressure line or from a separate independent source. Pumps, feed hoppers, can be supplied as required.

James F Shannon, Plastic Machinery Exchange, 426 Essex Ave, Boonton, NJ



Converter Quadruples Speed Of Any Bench Drillpress

Hi-Speed Drillmaster is a converter which fits into the chuck of any standard bench drillpress. Unit incorporates a precision-built gear train with a speed ratio of 4:1. The model exceeds U S requirements for concentricity for indicator readings of 0.002 in., holding to 0.0005 in. Spindle shank fits any ½-in. chuck, holding drills from 5/32 to No. 80.

Dirzius Machine Shop, 1423-25 S 52nd Ave, Cicero 50, Ill

Coolant Eliminates Odors

Johnson Wax Co coolant TL-131, a new water-soluble cutting fluid, reportedly will not cause foul coolant odors for two months. The manufacturer states that TL-131 is used in the same way as any conventional water-soluble coolant. The only condition is that the machine should be cleaned and then completely recharged with TL-131. It does not require the use of irritating formaldehyde of bactericides before it is placed in the machine. The solution is all chemical in composition and does not contain any fats or vegetable matter for bacteria to breed in. The coolant is designed to be diluted 40 to 1 with water.

Johnson Wax Co, Racine, Wis

GEARS *that keep* AMERICA *on the* GO!

Gears turn horsepower into motion—whether for work or for pleasure. In vehicles of almost every description—from boats to heavy farm machinery—you'll find flywheel ring gears, transmission gears, differential drive gears, and other gears that are designed, engineered, and manufactured by Automotive Gear Works rendering the best possible service in the transmission of power.

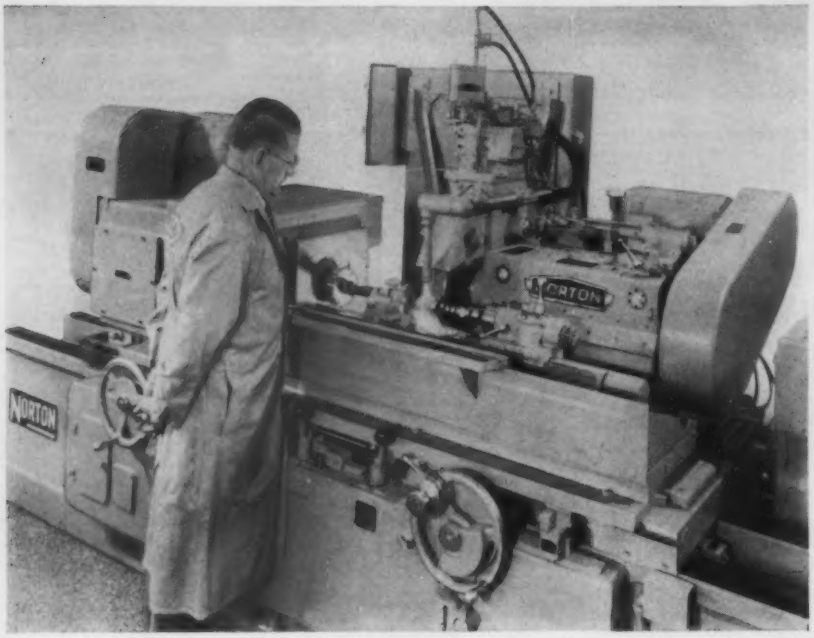
If you have a product that serves up-and-going America it may be worth your while to learn how our staff and facilities can best be utilized to supply all your gear needs—and how we serve as the "gear department" for many leading manufacturers. Why not write today for further information?

DOUBLE DIAMOND TRADE MARK GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

ESTABLISHED IN 1914 RICHMOND, INDIANA



New Automatic Cam Grinder Features Positive Work Drive

The Cam-o-matic No. 3 precision automatic cam grinder of Norton is said to provide faster grinding of automotive camshafts with better finish and simpler, sturdier construction details than previous models. Among the main features is the positive work drive—Gilmer timing belt produces smooth work rotation.

The machine has two automatically controlled workspeeds. The higher speed is adjusted for optimum rate of stock removal. Change from fast to slow speed is automatic. Timing can be adjusted by setting lever on wheel feed mechanism.

Grinding action has been improved by using one-piece racking bar of increased cross-sectional area. Tapered roller bearing supports center of bar. Combined with the heavier sliding and swivel tables, this permits heavier wheel feeds.

Automatic wheel guard truing cycle begins after last cam has been ground, regardless of angle of wheel slide. Since the truing mechanism is built into the wheel guard, there is no swiveling of the wheelhead prior to truing when grinding tapered cams.

Norton Co, Worcester 6, Mass

Fluid Drive Cranes

Precise control and operating smoothness are obtained on these cranes by eliminating the solid connection between motor and driven equipment and replacing it with a quiet, oil-operated unit. Units are available in one to five-ton capacities with spans of 16 to 40 ft in each capacity range.

Features include: all motors totally enclosed, high-torque, ball-bearing equipped for ac or dc use; double-reduction helical-gear reducer with efficiency of 96 to 98%; electric solenoid shoe-type spring-actuated brake which closes immediately when flow of current is interrupted; speed and rate of acceleration adjustment provided for maximum control and to suit desired conditions.

Philadelphia Tramrail Co, 3420 N Weikel St, Philadelphia 34, Pa

Protective coating, vinyl-based Tygon ATD, is hot-spray applied, and reportedly builds a film thickness in two coats equal to five coats of cold-spray coatings. Quick-drying film is said to be extremely impermeable, and resistant to most acids and alkalies, as well as to alcohols, water, and oils.

US Stoneware Co, Akron 9, Ohio

Pressure Switch is Gasket-Mounted

Gasket-mounted pressure switch is said to provide ease of installation, maintenance, and replacement when applied to hydraulic presses, production and processing machinery, machine tools, and similar industrial oil-hydraulic equipment. Designated Series SG1-02, switch extends the Vickers line. Special sub-plate is available to permit mounting in applications where machined pad is not provided.

Switches are available in three models: 100 to 1000 psi; 100 to 2000 psi; and 500 to 5000 psi. Pressure settings are adjustable throughout complete range. Over-all dimensions for each of these sizes are 3⅞ x 7 11/16 x 2 in. Nominal current ratings are 10 amps at 110 volts ac for 100 to 1000-psi size, 5 amps at 220 volts ac for 100 to 2000-psi size, and 3 amps at 440 volts ac for 500 to 5000-psi size.

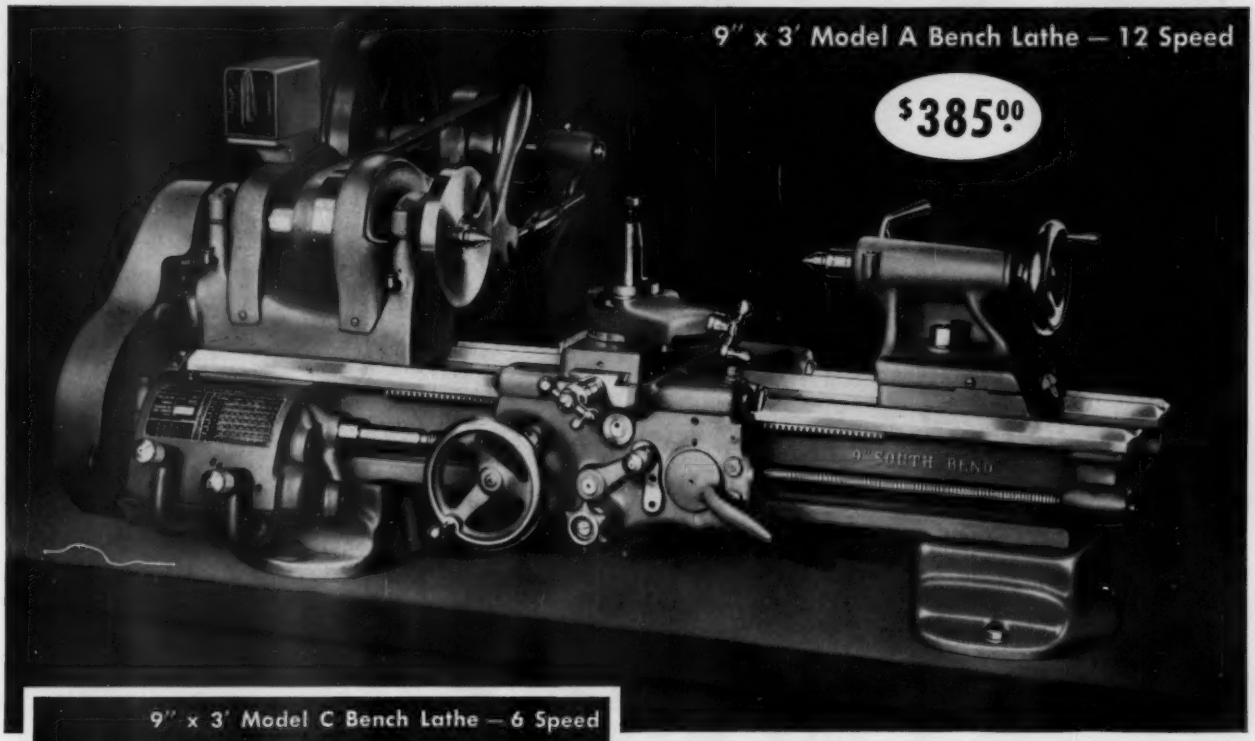
Vickers Inc, 1400 Oakman Blvd, Detroit 32, Mich

Dry Chemical Pipe System Approved by Underwriters Labs

Dry chemical piped system has been approved by UL—it provides automatic fire protection against Class B and Class C fire hazards by means of dry chemical. Approval means system can be installed to protect such hazards as paint dip tanks and spray booths, ovens, driers, oil quench tanks, and flammable liquid pumping stations. The automatic systems are operated either by pneumatic rate-of-rise type of heat detection devices or by electrically-operated releases. Doors, windows, ventilation ducts, etc., can be closed automatically by system's nitrogen pressure.

Ansul Chemical Co, Marinette, Wis

HERE'S MORE FOR YOUR MONEY



NEW CATALOG

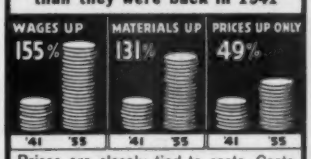
Describes 9" to 16-24" Lathes, ½" and 1" collet Turret Lathes, 14" Drill Presses, 7" Bench Shapers and Pedestal Grinders. Ask for Catalog 5406.

South Bend 9" Lathes represent far greater value than their moderate prices indicate. They are exceedingly accurate, quickly adaptable to a wide variety of work and built to give long, dependable service. These quality features can be offered because of the production economies resulting from volume manufacturing.

We sincerely believe that they represent more actual dollar-for-dollar value than any other lathe made. Evidence of this lies in the fact that they have out-sold all others. You'll be surprised at the many places these lathes can be efficiently worked into your production plans. Now is the time to have our distributor give you complete information.

(Prices shown are f.o.b. factory, less electrical equipment.)

Compared with our costs ~
OUR PRICES ARE LOWER
than they were back in 1941



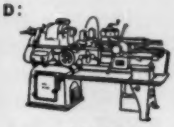
Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES



☐ ½" & 1" Collet TURRET LATHES

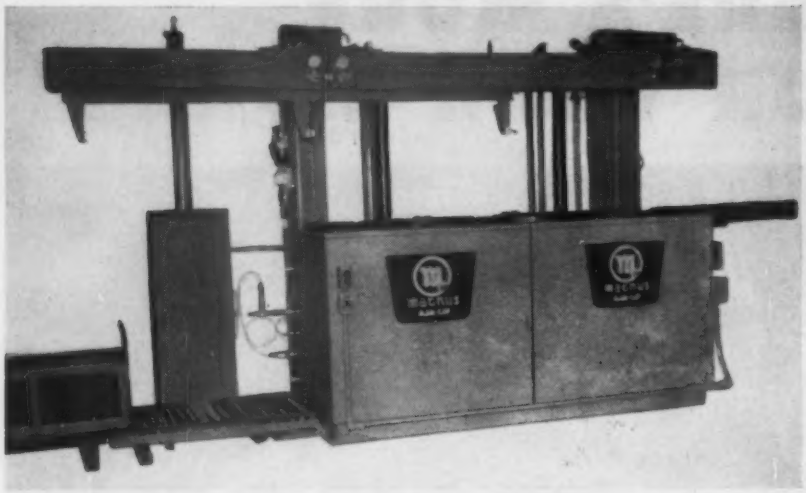
☐ TOOL GRINDERS

☐ 7" BENCH SHAPERS

Name_____ Street_____

City_____ State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

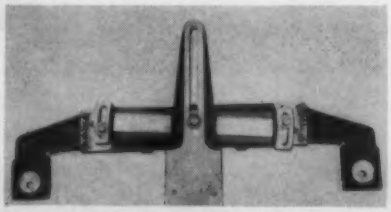


Automatic Cleaning Machine Uses Mechanical Agitation

The Magnus Aja Lif Automatic cleaning machine is equipped with "nu-matic push device" and air lift loading. Work is pushed along floor to lifting roller platform which raises work to proper level while similar roller platforms in each tank raise to same level. Push drive device with collapsible dogs above tanks transfers each batch of work one step forward at each cycle.

By means of timing device which synchronizes push drive with air lift loading, platforms are lowered in cleaning solution and agitated for necessary length of time.

Equipment Div, Magnus Chemical Co, Inc, Garwood, NJ



Quick-Clamp Taper Attachments Fit All Types of Lathes

Heavy-duty taper attachments have been developed that require only single over-arm connection to lathe cross slides.

They incorporate dovetailing slides or ways to assure a high degree of accuracy and a simplified method of clamping to any lathe, permitting setup in minutes. Only two dimensions need be given for factory fitting: length of the carriage, and distance across top of the 45° V-way of lathe to be fitted.

Shipping weight is about 80 lb; prices range from $150 to $175. For smaller lathes with 10-in. swing, lighter-duty attachments are available for $45.

Master-Taper Co, 4543 N Clark St, Chicago 40, Ill

Redesigned Boring Heads

Flynn Mfg Co announces a change in their former No. 6 and 7 micrometer offset boring heads. Formerly load was placed on tool block by the end of shank. When shank was screwed down to produce proper load it was locked in position by turning threaded lock ring. New design provides for permanent preloading of tool block. A cup-type backplate is screwed into head at factory, applying proper pressure on tool block and locked in position by locking ring. Shank turns into threaded backplate and may be changed at any time without disturbing load on block. New heads will be designated as 6-B and 7-B and will use Flynn 150 Series shanks and arbors.

Flynn Mfg Co, 133 Flowerdale Ave, Ferndale 20, Mich

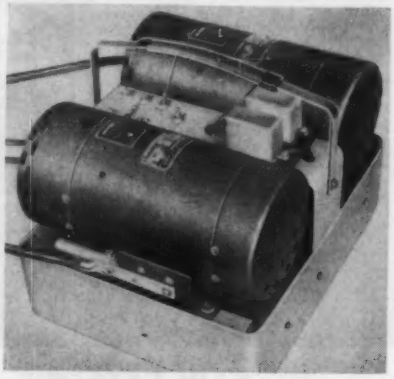
Adhesives for High Temperatures

Two modified phenolic adhesives recently developed by North American Aviation are said to provide weight-saving, strength, and service qualities in high temperature and humidity environments.

NAA Hi-Temp is used for bonding metals and reinforced plastics. CHT, a modification, is utilized in the fabrication of heat-resistant sandwich constructions. Aluminum foil honeycomb core materials are presently being used in this type of construction for the fabrication of secondary aircraft structures. CHT is applied only to the top and bottom aluminum facing surfaces which may be joined to the core in one curing operation.

Rubber & Asbestos Corp and American Latex Products Corp have been licensed to manufacture and market the adhesives.

North American Aviation, Downey, Calif



Portable Welder Has Large Capacity

Model 2BW takes small space of 13x16 in. and is 11 in. high but has amperage output of 15 to 140 and open circuit voltage of 40 v. Input is 110/220 volts, ac or dc with line-draw of 24 amps. RPM is 7500; amperes are continuous duty 15 to 100; number of welding controls 12; and welding hp 3.6.

Standard equipment includes two 7-ft electric wires, 8-ft welding and ground cables, ground clamp, a 300-amp electrode holder, helmet, sample electrodes, and complete instruction booklet.

The Generator Sales Co, 1627 N Damen Ave, Chicago 47, Ill

Everybody claims to be best—Illinois Gear *proves it with every gear order* that we deliver!

We have the best equipped plants in the world, ready and able to deliver gears of any type and in any quantity—whether it's one gear, ten thousand, or more. We have the finest craftsmen—men who have spent the major part of their lives making only one thing—fine gears. We have a pride in our product and a desire to please that make an immeasurable contribution to the quality of our product and our service. We have precise quality control that insures you the uniformity and dependability that you need. This quality is no accident, for one machine in every six is used for quality control and one man in every ten is a full time quality control man.

Send your next gear order to Illinois Gear & Machine Company. Dependability proven by performance.

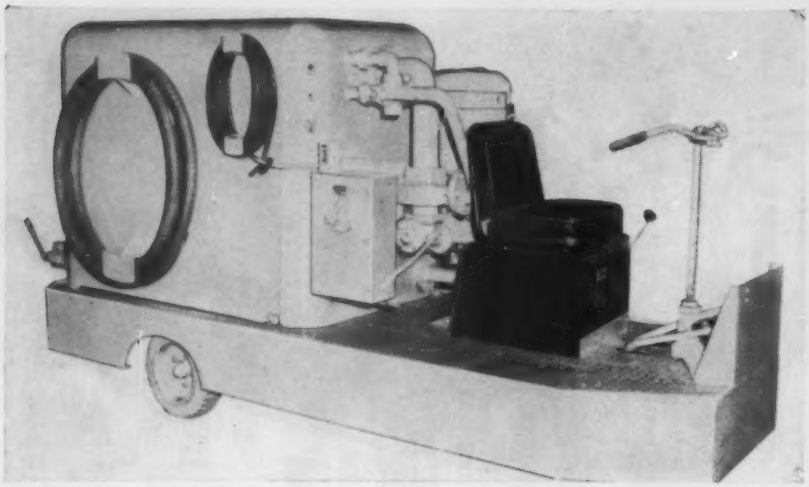
Look for this mark (ILG) *... the symbol on finer gears*

ILLINOIS GEARS
Reg. U.S. Pat. Off.

Gears for Every Purpose ... one gear or 10,000 or more

ILLINOIS GEAR & MACHINE COMPANY

2108 NORTH NATCHEZ AVENUE • CHICAGO 35, ILLINOIS

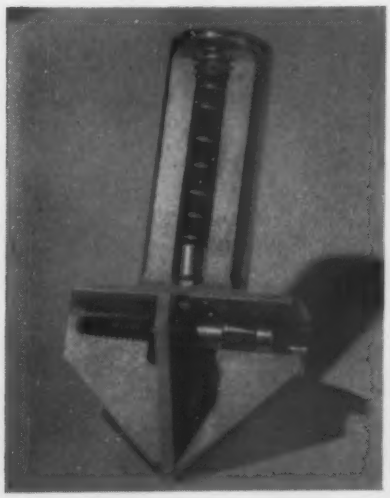


Large Mobile Scavenging Unit Cleans Sumps and Drainage Pits

The Sludge-King, reportedly the largest mobile scavenging unit for big-plant cleaning of machine sumps and drainage pits, collects, hauls, and discharges waste oil, water, and sludge containing metal chips and grindings, including abrasive elements, metal objects, etc. The unit develops a vacuum of 28 in. of mercury and handles 200-gal. loads. A shift of the valve lever converts the vacuum generator to a pressure pump developing 20 psi. Discharge pressure is governed by adjustable safety valve.

Truck is powered by 13-hp two-cyl air-cooled engine, is 99 in. overall, turns in radius of 82 in.

The Laidlaw Co, 1606 N Illinois St, Indianapolis 2, Ind

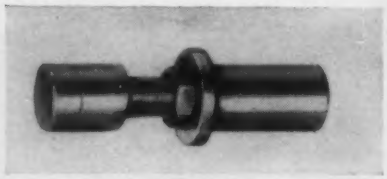


Deburring Tool

Deburring tool for holes ⅛ to 1 in. in dia in any machinable material has been designed to operate without chatter in a drillpress or any machine capable of rotating the tool at surface speeds recommended for the material being machined. Unit may also be used as a hand tool for many applications.

Basic principle involved is a controlled feed or thickness of chip being removed. This is obtained by regulating the protrudence of the cutter blade beyond the body of the tool with an adjusting screw projecting through a hole in the cutter blade. Blade floats to proper alignment, equalizing the chips being removed.

Randles & Reynolds Machine Co, Alpena, Mich



Revolving Stops Insure Precision Stock Length

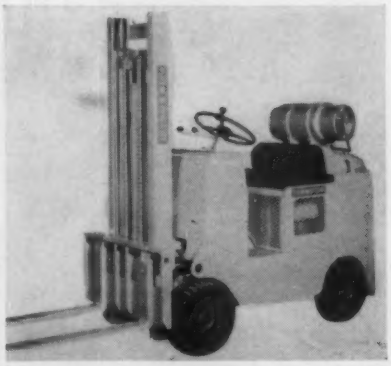
New revolving stop design is said to insure greater precision of stock length on screw machine work. Stops have free-turning heads which revolve easily on ball bearings. Fine-pitch threads permit making micro-adjustments without disturbing body of tool. Stops are designed with shoulder on body which rests against turret for positive location. Stop sleeves can be reversed in body and used through turret for machining long workpieces. Marcellus announces that three sizes are available: Model OORS with 39/64-in. face, ⅝-in. shank; Model ORS with ¾-in. face, ¾-in. shank; and Model 2RS with 1-in. face, 1-in. shank. Stops are also available with carbide faces or with special faces recessed at center to allow accurate locating of work having cut-off burrs.

The Marcellus Mfg. Co, Belvidere, Ill

Double Trackage System Moves Skids and Pallets

Double trackage system is adaptation of original single Epco trackage system. Rolling function is performed by trackage itself which consists of series of rollers containing sealed ball bearings designed for floor operation. Material roll is carried on special flat bottom dolly which glides over track rollers when pushed by one man. Any load can be carried on a skid which bridges two parallel rows of trackage. Legs of skids are actually runners, one on each side which slide over rollers of trackage. Turntables are used to change direction.

Engineering Products Co, Inc, 122 S Michigan Ave, Chicago 3, Ill



Towmotor Trucks Available With LP Gas Fuel Systems

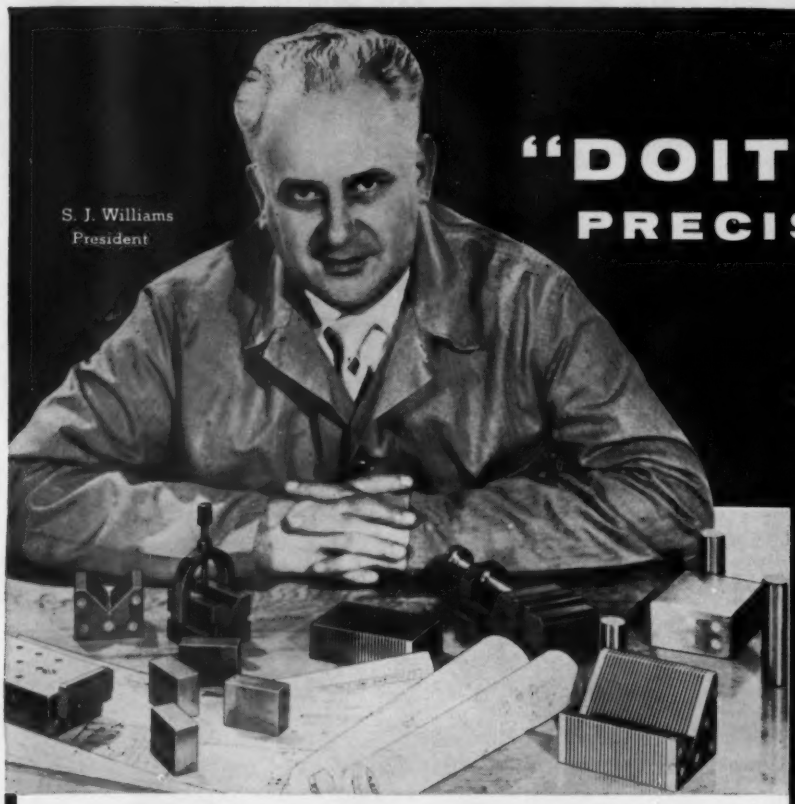
All Towmotor lift trucks are now sold in both gasoline and LP gas models.

Among the advantages of the latter system, according to the manufacturer, are lower cost (LP gas averages from 2 to 7 cents less than gasoline per gal.), longer engine life, complete fuel combustion which prevents oil dilution and downtime caused by carbon deposits, longer spark plug life, more mileage from oil, higher octane rating.

Gasoline fuel systems on equipment now in use can be converted to LP gas.

Towmotor Corp, 1226 E 152nd St, Cleveland 10, Ohio

TOOLMAKERS . . MACHINISTS . . APPRENTICES . . STUDENTS . . MANUFACTURERS . . MACHINE SHOPS



NEW "DOIT" URSLF PRECISION TOOLS

Slash the cost of toolmaker's tools!

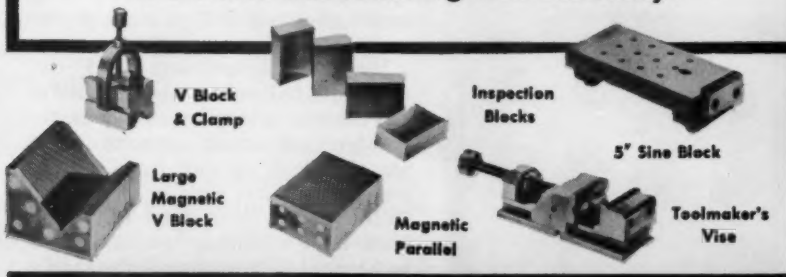
and make possible greater earnings for metal workers . . . greater savings for the companies that employ them!

do better work! get better pay!

Could you do better work if you owned better tools? Of course you could! You'd get better pay! That's why "DOIT" URSLF is so important! Up to now you may not have felt you could afford to buy such tools as these. But "DOIT" URSLF, a remarkable new approach to the manufacture of toolmaker's tools, cuts costs to the bone . . . allows you to own the very finest tools for pennies where otherwise you'd have spent dollars.

The "reason why" that makes these tremendous savings possible is simple:

"DOIT" URSLF furnishes all materials!
"DOIT" URSLF gives you complete drawings and instructions!
YOU do all the finishing and assembly!



cut costs! cut labor! cut "down" time!

The cost-conscious machine shop or manufacturer will find hundreds of special applications for "DOIT" URSLF tools that will save time and money and add to the flexibility of expensive machinery.

The variety of magnetic tools, alone, offered by "DOIT" URSLF, will be impressive.

Assembling and finishing any "DOIT" URSLF tool is simple—even for a student or apprentice.

Distributors . . . Mill Supply Houses . . . Manufacturers' Representatives . . .
INQUIRIES INVITED!

S. J. WILLIAMS Precision Tool Kits, Inc.
makers of "DOIT" URSLF Precision Tools
4448 Soo Line Lane • Schiller Park, Ill.
PHONE—Gladstone 5-5200

WRITE FOR A FREE CATALOG TODAY!
Mail this coupon! You may paste it on a postcard if you wish!

S. J. WILLIAMS Precision Tool Kits, Inc.
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Please send me the FREE "DOIT" URSLF Precision Tool Catalogue.

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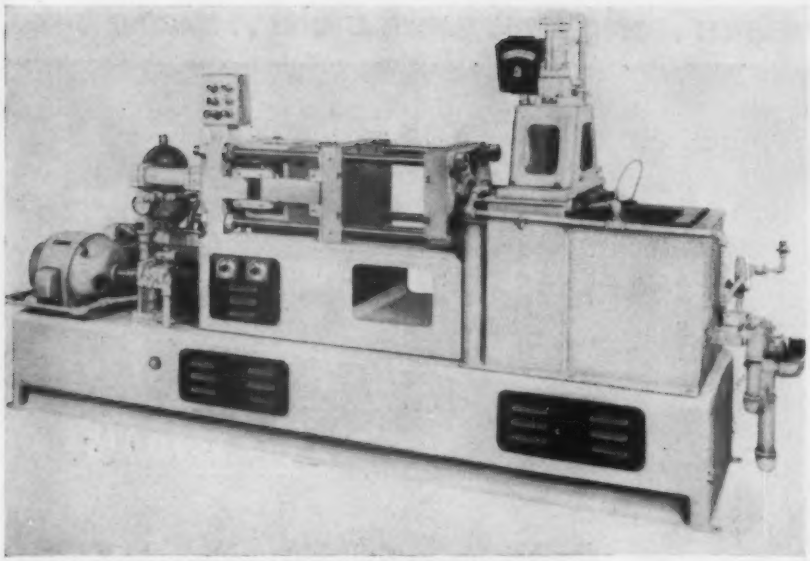
AM-5

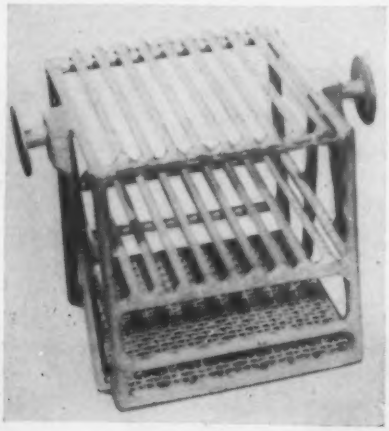


Die Casting Machine Handles 2½-lb Shot at High Speed

American Die Casting Machinery announces a low-cost high-speed machine said to have features and workmanship of larger, costlier machines. It has all-steel welded construction and features a locking pressure of 80 tons. High-speed cycling (up to 700 shots per hour) is automatic, controlled electrically. Die platens are 17¾ in. square and die stroke is 6½ in. The moving platens are supported by bronze carrier shoes.

Machine is available with air- or hydraulically-controlled plunger; goose-neck type for zinc, tin, and lead; cold-chamber type for aluminum, brass, and magnesium.

American Die Casting Machinery Co, 1516 W Thomas St, Chicago 22, Ill

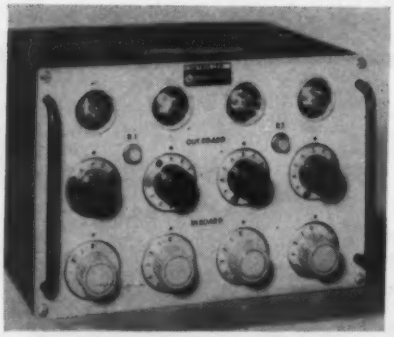


Conveyor Basket

Wiretex Inconel conveyor basket used on an automatic jack rabbit salt bath conveyor takes three hours for the basket to go through the complete heat-treating, washing, and drying cycles, with temperature of heat-treating cycle at 1650 F and 40 min spent in the carburizing bath with quenching in agitated oil at 120 F, reportedly put into use four months ago and operating on 24-hour basis, shows no signs of corrosion or warping.

The basket allows completely automatic loading and unloading and is said to carry a maximum number of parts in minimum space, and to expose the largest possible surface area to each part for contact with molten salt and quench oil.

Wiretex Manufacturing Co, 40 Mason St, Fairfield, Conn

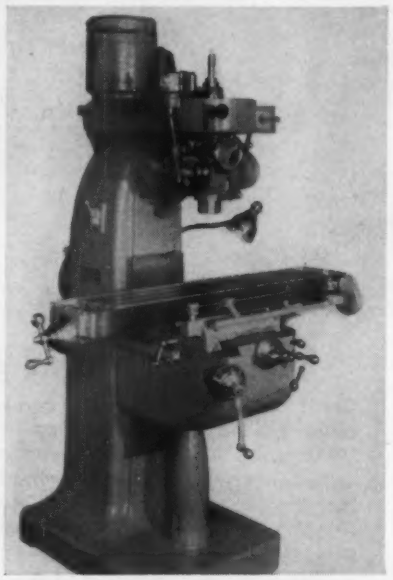


Automatic Digital Controller For Machine Tool Operations

Heart of the automatic controller for machine tool operations is a 7x10x 8-in. unit with count capacity of 2500 counts which adds and subtracts at rates to 20 decimal digits per second with accuracy of 0.04%.

In a typical application, controller was developed in conjunction with Sheridan-Gray, Inc, to be used on line of stretch-forming machines. Sheet of aluminum is placed in stretcher, small transmitter establishes digital count as machine is operated manually through complete operation. The American electronic transmitter, consisting of mechanical switch and capacitor, sends pulses to a thyratron in the controller and count is noted at start and stop of operation. All succeeding work is controlled by these two counts preset by two sets of switches.

American Electronic Mfg, Inc, Culver City, Calif



Super 55 Vertical Milling Unit Has Greater Production Capacity

Improved Super 55 vertical milling machine for boring, milling, and drilling operations offers a 1½ or optional 2-hp head with heavy-duty motor affording 50% or more capacity than previously available.

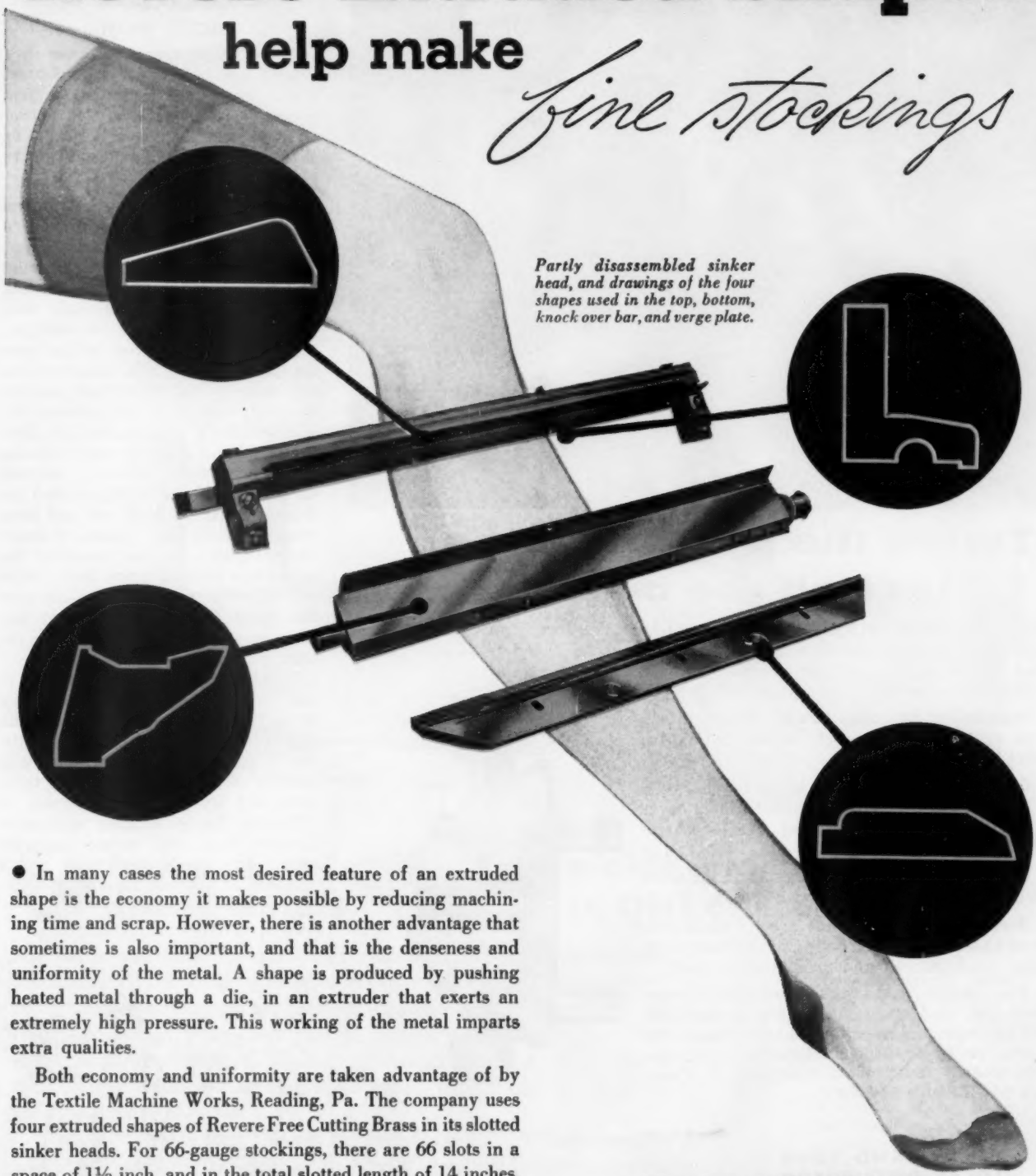
Increased horsepower and dynamically balanced cast-iron pulleys and drive system make possible greater production capacity. Flywheel effect of cast-iron pulleys greatly increases rigidity of spindle. Redesigned system of table gibs allows table clamping mechanism to be brought to front side of the saddle and still retain rod trays adjacent to the fixed table slideway.

Capacity: ⅛ to 1½-in. end mills in tool steel, 2-in. or more in milder steels or cast iron. Table size, 40x9 in., or 46x9 in.

Index Machine Co, 543 N Mechanic St, Jackson, Mich

Revere Extruded Shapes

help make *fine stockings*



Partly disassembled sinker head, and drawings of the four shapes used in the top, bottom, knock over bar, and verge plate.

● In many cases the most desired feature of an extruded shape is the economy it makes possible by reducing machining time and scrap. However, there is another advantage that sometimes is also important, and that is the denseness and uniformity of the metal. A shape is produced by pushing heated metal through a die, in an extruder that exerts an extremely high pressure. This working of the metal imparts extra qualities.

Both economy and uniformity are taken advantage of by the Textile Machine Works, Reading, Pa. The company uses four extruded shapes of Revere Free Cutting Brass in its slotted sinker heads. For 66-gauge stockings, there are 66 slots in a space of 1½ inch, and in the total slotted length of 14 inches, the tolerance is less than .001 inch. In order to achieve this accuracy, and be assured of straightness and flatness, Textile specifies shapes of extreme uniformity.

Perhaps your requirements are not quite so high as Textile's. Or perhaps they are higher. In either case, we shall be glad to explain how Revere Extruded Shapes can save you money, and at the same time help you maintain the highest quality standards. See the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

Twice the performance at half the cost!

The Jacobs Model 91 Spindle Nose Lathe Chuck delivers from two to four times more torque than any split steel collet chuck and costs less than half as much on a complete-with-collets basis.

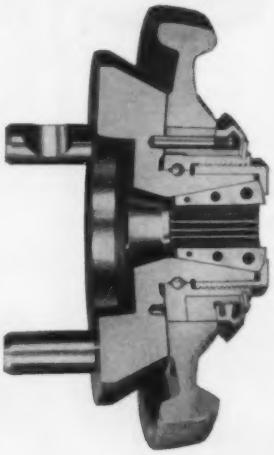
Here is the performance of the Jacobs Model 91:

Unequalled Gripping Power. Model 91 has 2 to 4 times the grip of present split steel collet chucks.

Capacity. Model 91 chucks any bar between 1/16" and 1-3/8". 11 Rubber-Flex collets cover the gripping range of as many as 88 steel collets formerly needed.

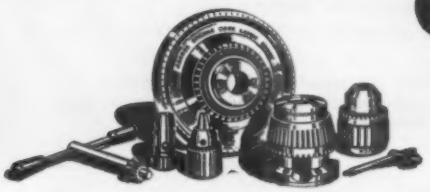
Unequalled Accuracy. Model 91 is the most accurate collet chuck in the world today.

Durability. Model 91 has a solid aluminum hand wheel. The forged body and all other chuck parts are hardened and ground alloy steel.



The Spindle Nose Lathe Chuck and the complete line of Jacobs Chucks are stocked and sold by industrial distributors everywhere. See yours, or write Jacobs Manufacturing Co., 1605 Jacobs Road, West Hartford 10, Conn. Ask for Bulletin 54A-LC.

JACOBS AND YOUR LOCAL DISTRIBUTOR
are ready to deliver the chucks you need and the service you deserve.
first in chucks . . . first in service



Jacobs
CHUCKS
If it's a Jacobs–it holds

ROUND TABLE *Discussion*

BUMS' RUSH

Is it normal to expect the shop men to give a new engineer a hard time, particularly if he's pulled a few boners in the beginning? Can a foreman do anything to prevent it, or should he let the new man take care of himself?

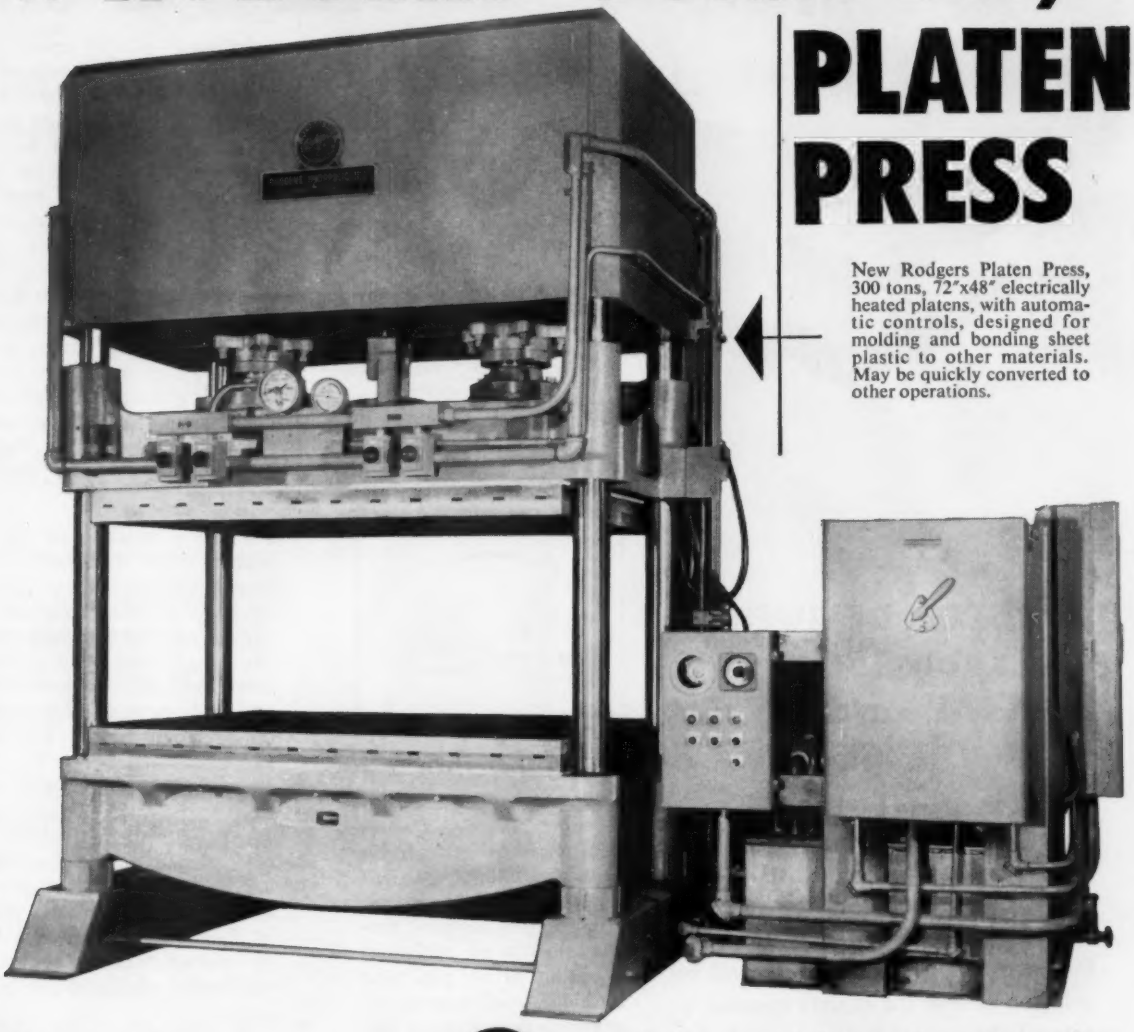
IT IS INDEED REGRETABLE that a new man just starting in should have to run the gauntlet of the green-eyed monsters who are under the allusion that any newcomer is someone being injected in the path of their own progress. At the base of it is jealousy.

Let us take a gander at the new engineer and see if he deserves the treatment some of the men delight in giving him. It is only natural for him to make a mistake now and then —a mistake if made by anybody else would have been tactfully covered up or considerably diminished in degree. A tactful hint now and then often smooths the ripples of inadvertent errors, but unfortunately the newcomer isn't accorded this smokescreen—he has to take it on the chin full force, often aggravated by unnecessary criticism by those who resent his presence.

What particularly gripes me is to see fellow-workers influenced by these trouble-making log-heads who try to impress others by their mathematical shrewdness. These will usually form little kingdoms of their own and try their very utmost to influence many another otherwise neutral man into conspiring with them to wreck the new man's chances of success. Instead of lend-

"The machine shop ain't the rough-and-tumble place it used to be. One of the guys is even using after-shave lotion!"

New RODGERS "Double Duty" PLATEN PRESS



New Rodgers Platen Press, 300 tons, 72″x48″ electrically heated platens, with automatic controls, designed for molding and bonding sheet plastic to other materials. May be quickly converted to other operations.

1 forms or draws metals

2 molds and bonds plastics in ONE operating cycle

Are you processing both metals and plastics? This newest Rodgers Platen Press is quickly converted for metal or plastic operations—a "double feature" advantage that means equipment savings for you.

Heated platens, which mold sheet plastic *and* simultaneously bond it to metal, rubber or other materials, are interchangeable with metal forming or drawing dies. By using pneumatic die cushions, the press can be converted for deep drawing of metals.

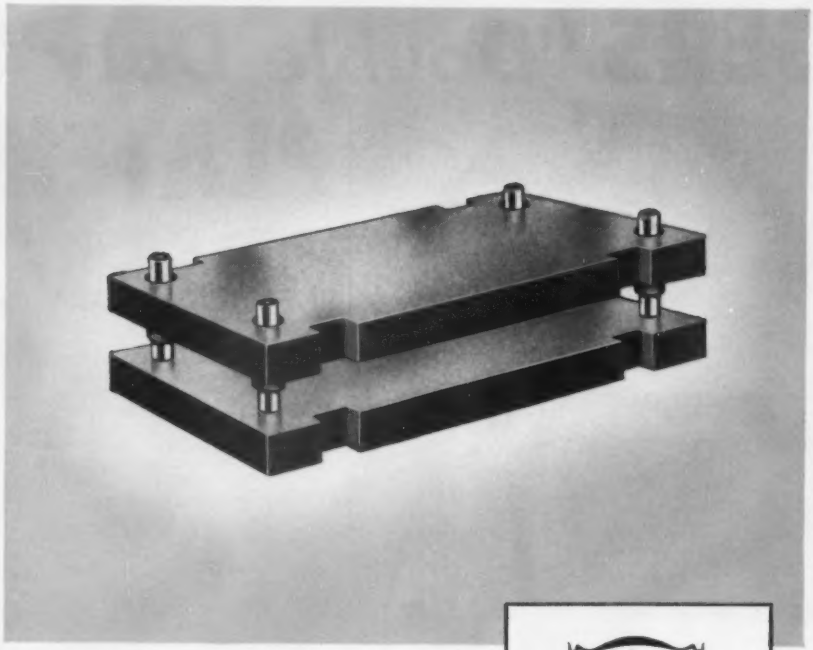
Rodgers "Double Duty" Presses are available in 10 to 500-ton capacities and with platen sizes from 12″x12″ to 72″x48″. Precision control equipment automatically governs platen movement, pressure, time cycles and temperature. Operator safety is assured by equipment design.

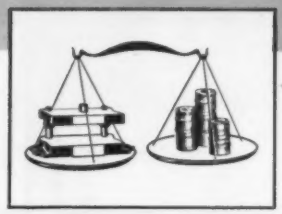
MANUFACTURERS. If you're processing metals and plastics you'll be interested in this double duty press; let us send you more information and also a copy of our catalog describing other Rodgers "Blue Ribbon" Presses for plastic and rubber molding, metal drawing and metal forming.

HYDRAULICS Rodgers KEEPING THE WORLD MOVING

Rodgers Hydraulic Inc.

7407 Walker Street • Minneapolis 16, Minnesota





FASTER DELIVERY *on Both* SPECIAL and STOCK DIE SETS

Now . . . you can get into production faster with a Detroit special or standard die set. *First,* because of our greatly expanded facilities, we are now making delivery in less time. For instance, a standard die set will be shipped within 24 hours; specials in remarkably short time. *Second,* because every *full-value* Detroit die set is built up to our high standard and not down to a price and is factory-tested to specifications. Such precision gives you faster mounting without the delay and cost of reworking the set in your shop. Why not talk things over with our nearby representative? Write today.

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means that in a special or standard Detroit die set you get what you pay for . . . the exact, specified thickness of both die holder and punch holder, true parallelism of surfaces, precision fit of pins and bushings — all assured by precision manufacture, factory assembly and factory inspection.

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PRECISION-BUILT ACCESSORIES

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Offices in Principal Industrial Centers

ing a helping hand when the poor guy is a little over his head, they take particular delight in shoving him down.

In view of the many difficulties which a new engineer has to contend with in order to get himself synchronized with strange proceedings, it seems to me that he should be protected by his superior. As the one responsible for the new man, Al should certainly take steps — and very firm ones if necessary — to see that he is given every chance to make good. Taking on a new job is difficult even with warm cooperation, but it is nothing short of hellish to tackle a new situation when the industrial ghouls smile while they obstruct every move one makes.

Wally Hunter
Ambridge, Pa

FROM MY READING OF THE UPSET, it would seem that both Al and his squad are too destructively critical. Perhaps a little constructive offering on the part of both would give the whole matter a different look. Some new brooms are apt to dive in at the deep end with mortifying results, when a less spectacular approach might carry the men with them, to the benefit and satisfaction of all concerned. Unless the workers are fully informed of the pros and cons of any change bearing on their earning potential, they will undoubtedly be fiercely critical, and if shop harmony is not to be shot to pieces, matters involving controversy must not be allowed to drift.

Provided we are not dealing with professional agitators, there is no moral justification for continued dissatisfaction. Were Al to speedily get down to brass tacks, instead of merely declaiming his men, an improved shop climate would surely

"Having group insurance doesn't mean all of you had to come."

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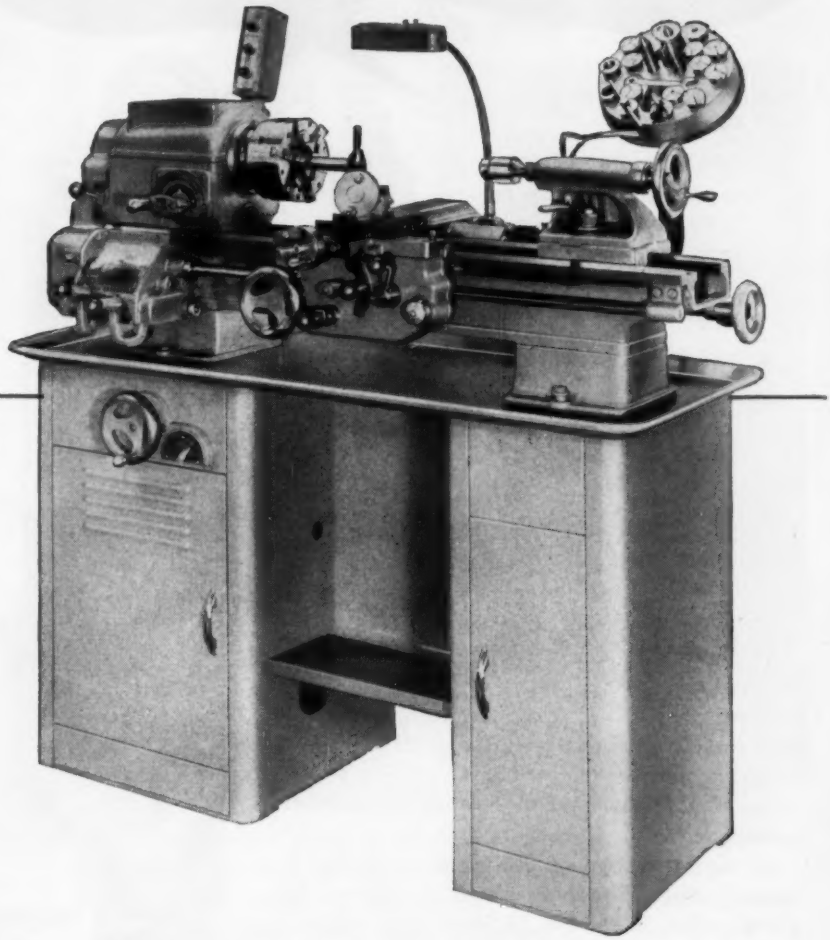

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SINCE 1868
The Mark of Superiority

result. His first and most urgent step is to inquire into the precise nature of their dissatisfaction and to decide if they have good reason for discontent. If he considers they have some reason for complaint but, that they are hastily condemning the new engineer, Al should counsel restraint and promise to talk matters over with the new broom in an effort to straighten out any misconceptions. At all events, before Al, a responsible executive, comes to a conclusion, the new engineer should be heard. He should be given ample opportunity to explain the actions which the men take exception to and should be invited to outline his ultimate aims.

Al should certainly take immediate steps to help the new engineer to protect *himself*. He could do this by having a talk with the man, and by making him aware of the bad feeling in the shop if, indeed, he is not already aware of it. Additionally, the new broom must help himself. Al, having broken the ice, will have given him an opportunity to explain his position. Such an explanation would, no doubt, make clear to Al the reasons for any change in hitherto existing shop practice which the new engineer's innovations may have upset. That would be Al's chance to give the new man some friendly advice which would be of value to him.

It would give him—the new man —an opportunity to reconsider the effects of his new measures on shop atmosphere, and help him to make up his mind as to whether the end he has in view justifies the means taken to attain that end. If the new broom can prove that, in the end, the men will be no worse off than

"I may cash in on the lesson I took when I was a kid. I'm going to ask the boss for a raise—How does 'Hearts and Flowers' start?"

This man can save you eyes, limbs, lives, and money

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Perhaps he had a boy of his own once who was seriously injured in a plant accident. Perhaps he heard the rending scream of a fellow worker blinded for life by a metal fragment worth less than a cent . . . or had the ordeal of explaining the accident to the man's wife. Perhaps a cost-conscious mind brought him into safety work plus the conviction that so many accidents happened needlessly.

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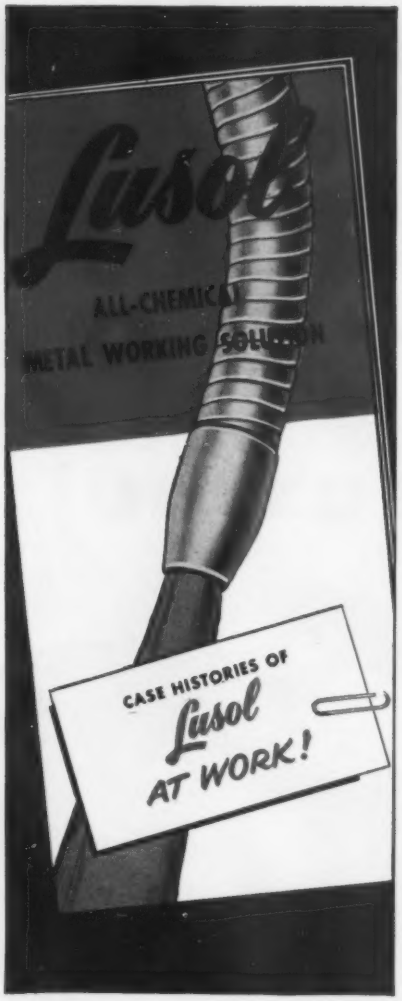


This leaflet tells how Lusol works to the advantage of the machine operator *and* management

FOR A FREE COPY— MAIL THE COUPON on the opposite page

before but, indeed, may, by increased application, be much better off, it would be Al's responsibility to insure that a full and free explanation of the new engineer's plan and all that it implies is put before the men. Only thus can Al help the new broom. Only thus can the new broom help himself and only thus can trouble-makers be effectively checkmated.

C Donald
Lanarkshire, Scotland

Do Al's men have the right to spoil conditions for anybody? Isn't it up to management to keep a man or discharge him if he doesn't come up to the mark? Do Al's men know under what conditions the new engineer is working? Probably not, and therefore they should not commit themselves about things they don't know. If the new engineer made some mistakes, the men ought to help him out of his difficulties—not make it worse for him.

If the new engineer is going to louse up the men's bonuses, he is either acting on behalf of the manager, or else trying to show the manager how strong a man he is. In the first mentioned case he has to take the blame for things he has nothing to do with, but on the other hand, if he is trying to cut the men's wages without reason he should be sensible enough to expect trouble. If he doesn't realize that, he is no good as executive. No union would accept any lowering of the men's pay without negotiating with the management. And no management would venture an action of that kind without giving notice to the shop steward. If it did, however, a strike would be the immediate answer. The only reason the union would accept lowering their members' wages would either be a general depression, or bankruptcy for the company involved.

Whether or not the boys should give the new engineer a chance has nothing to do with his standing, except through the union where a discussion on the subject probably would throw some light on things that Ed or Al have not mentioned.

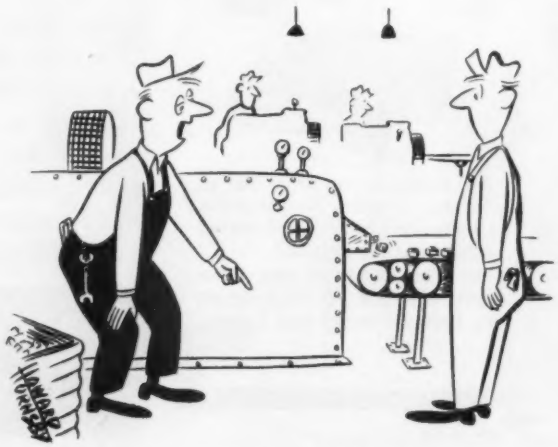
If the whole shop crew is unfriendly and distrustful toward the new engineer somebody must have told them about either what he has done at other places where he has been, or else they have lied about him. If I were Ed or Al I would talk to some of the best workers and find out what the trouble was all about.

Is Ed right in expecting the worst from the crew, or should Al take firm action to protect the engineer? Answer: The whole story is impossible from beginning to end. This kind of situation cannot occur today with our intimate cooperation between managements and unions. If this is an exception, it has nothing to do with conditions in up-to-date machine shops anywhere. And if the new engineer has the power to discontinue the mens' bonuses, how can Al protect him? He would probably have to ask the manager to get protection for himself!

A E Fristedt
Stockholm-Bromma, Sweden

Distrust magnifies trifles. Where workers fear that their job security is in jeopardy because of the actions of a newly-hired engineer, their suspicion and distrust of the man, perhaps unwarranted, magnifies some innocuous mistakes he unwittingly made as a direct threat to their earnings and jobs.

I suppose it's human for shop men to stiffen their defenses against sus-



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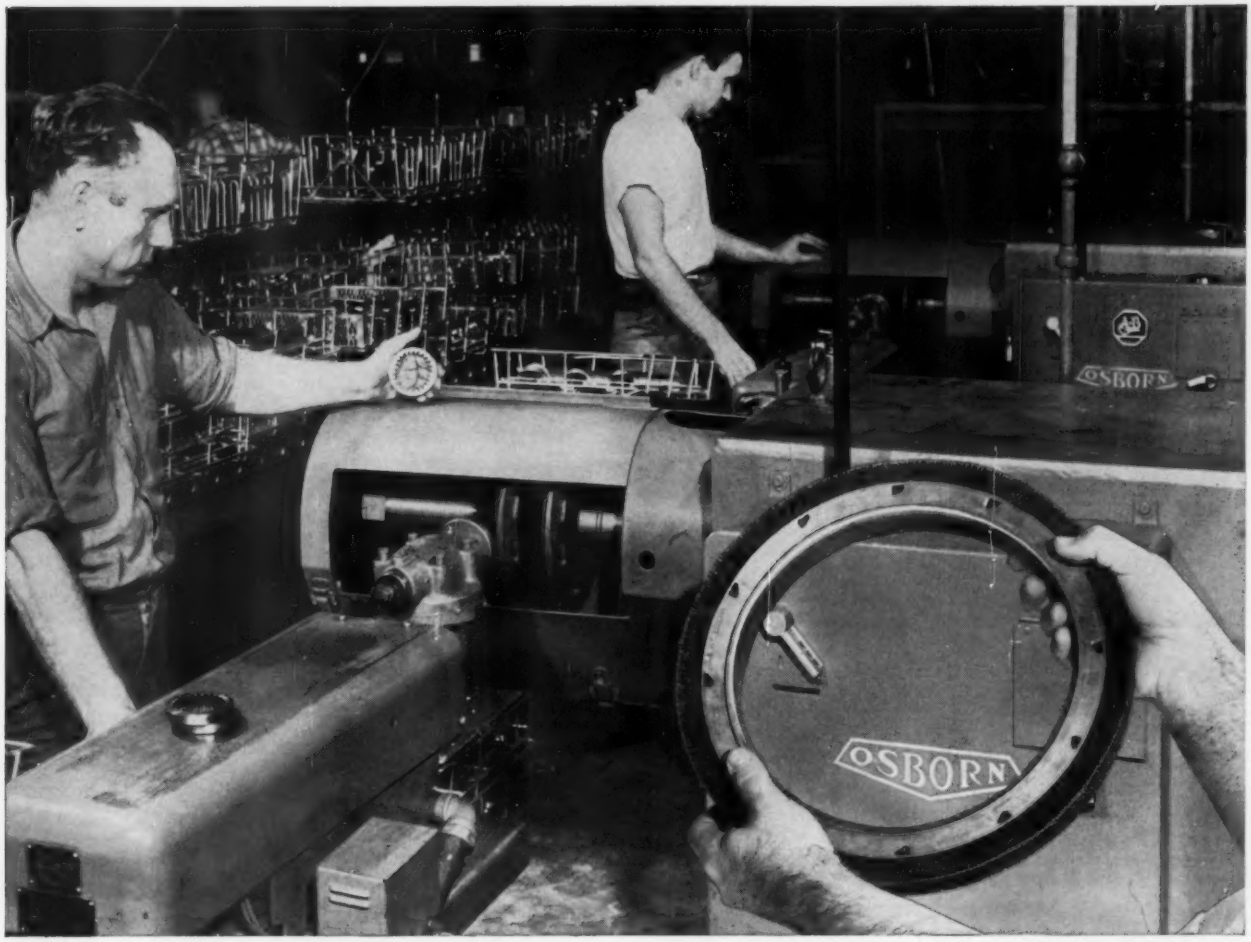
RIVETERS DIMPLERS

pected moves of a new engineer whose aim is to get more productivity at lower cost, interpreted by the workers as a move to make them work harder. We all fear the unknown, and we shouldn't be too harsh with those who fear that a new broom might do things in the shop that will weaken their own positions.

The workers who are giving the bums' rush to the new engineer forget all too soon their experiences when they were first hired on a new job. They forget that men are individuals with differing personalities, with a fear of new and unfamiliar situations, with a desire to succeed on the new job, an impulse to avoid censure and court approbation from fellow employees, and a whole complex fabric of traits, emotions, and characteristics. At almost no other time are the development of these characteristics and the relationships between them so subject to influence as when a man goes on a new job.

It seems to me in the case under discussion that the foreman was careless in orienting the new engineer to the job; probably the new man was not properly introduced to the men. It is little wonder that the new engineer was viewed with suspicion by his new associates. They weren't given the opportunity to know him. Management, through the foreman, should make certain that a carefully planned, friendly introduction and adequate information about working methods, equipment, and the men themselves are made part of the induction procedure for the new engineer. This indoctrination can aid materially in bridging the gap between unfamiliarity, uncertainty, and fear on the one hand, and job satisfaction, efficiency, and cooperation with the work group on the other. It's hardly fair to blame the treatment of the new man entirely

"Are you by any chance a lathe operator, Mr. Hoskins?"



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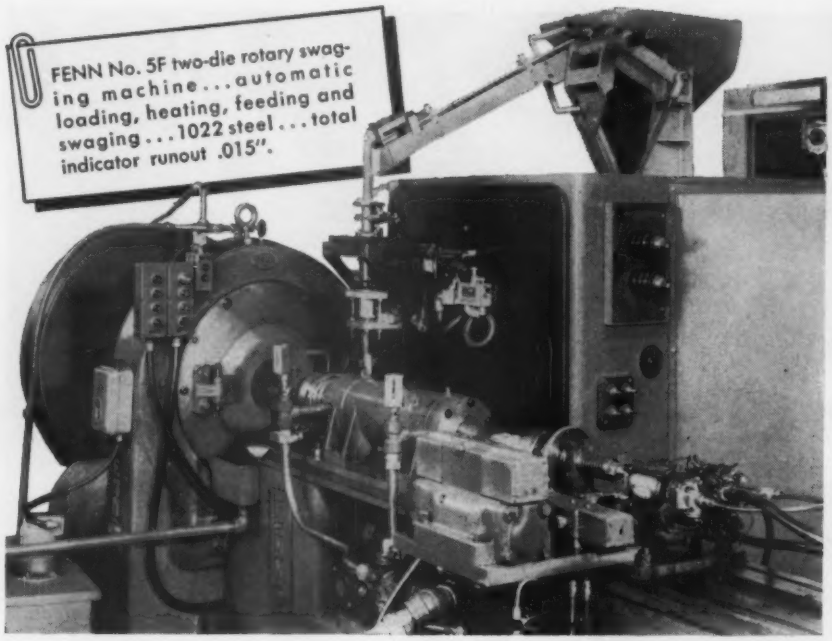

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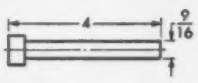
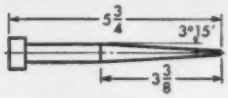
Change  to  at 500 per hour with full automation

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on inadequate shop spirit when the induction process is slighted.

The foreman should make the men realize through personal talks with them that a newcomer is faced with the problem of adjustment to personalities. For many a person, this presents the most serious challenge of all. He feels that all eyes in the room are focused upon him as he takes his place at his assigned desk or machine, and, very likely, this is indeed the case; strange eyes, appraising eyes, hostile eyes. There is little wonder, under such circumstances, that a sense of unhappiness and resentment is generated, to linger for weeks in the back of the new worker's mind, even after he has become acquainted with his fellow employees and found them to be average human beings like himself. He can hardly be blamed if he pulls a few boners, — — a circumstance that is hardly unusual for a new man, and which he could probably straighten out after a bit.

The reaction of the workers which culminated in the bums' rush for the new engineer can also be explained in the natural antipathy of shop men for the college man who probably comes to the shop with a lot of theory in his head, but not much practical knowledge. He has the know-how as far as engineering goes. But getting along with a gang of men depends on the men as well as the engineer. Many shop men believe that no white-collar man, particularly with a college degree, wants to get his hands dirty or work down in the shop. However, the workers should respect his engineering knowledge and give him the cooperation that will enable him to make their work easier and more productive.

In the case under discussion, the foreman should not permit himself to be influenced in judging the worth of the new engineer by the ill-advised bums' rush of some unfriendly

"I'm a new man, what if I gotta' go to the rest room?"

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with Improved Power Brush Machines

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FULLANCHOR Super-Balance WHEEL BRUSHES . . . reduce vibration, improve work-piece finish, decrease brush wear . . . because brush filaments are precision-spaced for precision-balance.

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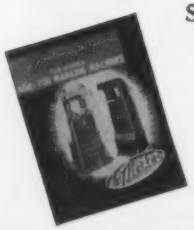

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and distrustful troublemakers. How good a man is at his new job and what he can develop into should be determined by formal checks by the foreman or personnel administrator during the man's stated 30 to 90 day probationary period. These formal reports to the personnel department insure against accidently overlooking either potential talent or potential trouble. Maladjustment and misplacement can be detected in this manner.

Harry Kaufman
Philadelphia, Pa

•

THE WHIPLASH

Will the shop men tend to work harder or faster if they are aware that the foreman is making notes on their work habits? Or will they grow resentful at his apparent lack of faith in them?

I DON'T KNOW HOW it makes other workers feel to have a foreman going around with a pad, taking notes on their efforts, but I certainly would resent it. When I am hired to do a job I like to have some confidence placed in me to do the work the best I can. There seems to be no reason why a foreman should not take such actions on a man he knows nothing about, as it is up to him to find out something about the man's workmanship; however, he should do this in such a way as not to make the fellow overconscious and nervous.

There are some shop foremen who seem to think that cowing methods are necessary in order to get the work out. I have found this so when the foreman used this sort of diplomacy to offset his own lack of knowledge and experience.

Effectiveness cannot be purchased with bluffing methods. I do not in-

"Are you sure my secretary didn't make up that chart for you . . . the spelling looks familiar . . ."

fer that all foremen going around with notebook or pad are windbags by any means, but I must say that the feelings of the workman must be taken into consideration.

Suspicion is an opiate which is very hard to overcome. Once the worker thinks that you have no faith in him, your goose is cooked. This thing of taking notes openly is, ethically, more honest than taking them down on the quiet, but we'll have to do a little juggling with this ethical business and mellow it with some good, sound, common sense. If you are going to do anything out of the ordinary, do it with a smattering of tact.

Use discretion in handling your notebook. Your mental notes may not be effective in detecting the slouch and shirker all the time, but the invisible notebook will be the means of assuring the men that you do have some confidence in them.

Rex Warren
Waterloo, Iowa

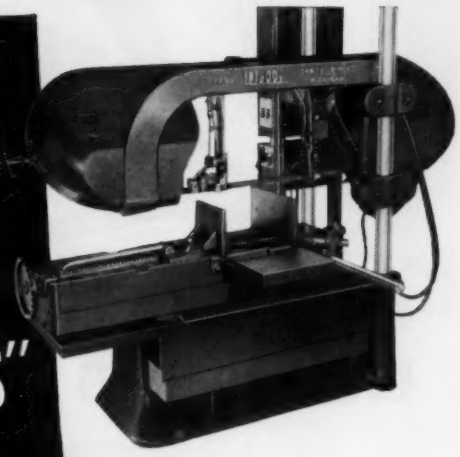
•

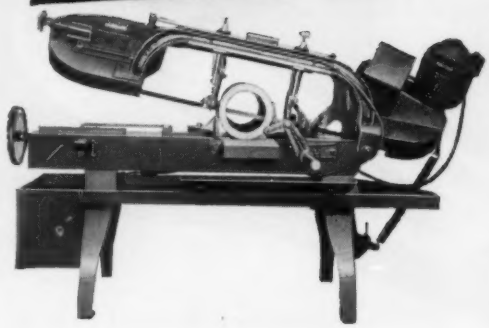
IN A WELL MANAGED COMPANY — one which gives the proper tools to its supervisors to work with — it is not necessary to take the approach that Ed is following. First, a good foreman, or in fact any supervisor, should, without obviously making it apparent, know what his men are doing. Certainly the little black book went out with the efficiency experts. If you are a supervisor and don't know whether your workers are giving you a good day's work for the pay being given, then you better supplement your own knowledge and study supervision.

It is admitted that there are certain pieces of information which one must have to make decisions and judge workers. To get this data one of the best methods of approach is to use some form of work report. This will show the job number and hours applied to that job. From this data, and knowing yourself about how much time a worker should spend, you have a control over the individual far better than your "black book." Usually the job is estimated by someone familiar with the work, and you have these hours to guide you. Then you have the worker's actual report of time to compare against it. Yes, sometimes trouble does make the job drag out, but you are always aware of that, for you must on these cases give additional assistance to your employee. So without a lot of red tape you get a series of reports which tell you far more than a walk through your de-

METAL "CUT-OFF" becomes a preferred job . . .

with rugged dependable "WELLSAWS"





featuring . . .

- **Easily Controlled Operation**
- **Fast, Accurate Action**
- **High Job Productivity**
- **Low Operating Cost**
- **Long, Dependable Service**

● Production, or utility "cut-off" work in your shop becomes a *Preferred Job* with a Wells Horizontal Metal Cutting Band Saw, because the *operation* is so *easy to control.* Even in the hands of the "new guy," a Wells Band Saw can be counted on to *Reduce* your *Production Costs,* through greater efficiency, more accurate cutting and real dependable service.

Another important *"key"* to better cutting . . . *New Constant-Load, Fool-Proof Blade Tensioning Control* found only on Wells Saws. And, for *more job profit* . . . Wells-O-Bar Feed Master will convert Models 8, 800 or 1200 into automatic cut-off machines for duplicate cutting.

Big Jobs, or Little Jobs, there's a "Wellsaw" for every metal cutting job around your shop. Standard capacities from 3½" x 6", on the new 49A "two-in-one" saw, up to 12¾" x 16", on the 1200 Heavy Duty Unit. Special machines have capacities of 24" and larger for Extra Heavy Duty and Unusual Jobs.

Call your Wells Distributor, or write for *Job Engineering Service.*

Wellsaws
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The Pioneers of Horizontal
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORPORATION
505 ROOSEVELT RD., THREE RIVERS, MICHIGAN

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by Parker

MARK UP TO
1000 PIECES PER
HOUR WITH
ACCURACY...
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and SPEED!

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#650
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Fully automatic, the #650 and #700 Marking Machines are used for production marking round or flat surfaces.

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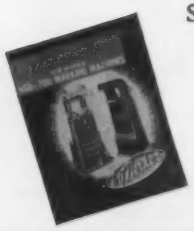

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THE PARKER STAMP WORKS, INC.
by Parker
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and distrustful troublemakers. How good a man is at his new job and what he can develop into should be determined by formal checks by the foreman or personnel administrator during the man's stated 30 to 90 day probationary period. These formal reports to the personnel department insure against accidently overlooking either potential talent or potential trouble. Maladjustment and misplacement can be detected in this manner.

Harry Kaufman
Philadelphia, Pa

•

THE WHIPLASH

Will the shop men tend to work harder or faster if they are aware that the foreman is making notes on their work habits? Or will they grow resentful at his apparent lack of faith in them?

I DON'T KNOW HOW it makes other workers feel to have a foreman going around with a pad, taking notes on their efforts, but I certainly would resent it. When I am hired to do a job I like to have some confidence placed in me to do the work the best I can. There seems to be no reason why a foreman should not take such actions on a man he knows nothing about, as it is up to him to find out something about the man's workmanship; however, he should do this in such a way as not to make the fellow overconscious and nervous.

There are some shop foremen who seem to think that cowing methods are necessary in order to get the work out. I have found this so when the foreman used this sort of diplomacy to offset his own lack of knowledge and experience.

Effectiveness cannot be purchased with bluffing methods. I do not in-

"Are you sure my secretary didn't make up that chart for you . . . the spelling looks familiar . . ."

fer that all foremen going around with notebook or pad are windbags by any means, but I must say that the feelings of the workman must be taken into consideration.

Suspicion is an opiate which is very hard to overcome. Once the worker thinks that you have no faith in him, your goose is cooked. This thing of taking notes openly is, ethically, more honest than taking them down on the quiet, but we'll have to do a little juggling with this ethical business and mellow it with some good, sound, common sense. If you are going to do anything out of the ordinary, do it with a smattering of tact.

Use discretion in handling your notebook. Your mental notes may not be effective in detecting the slouch and shirker all the time, but the invisible notebook will be the means of assuring the men that you do have some confidence in them.

Rex Warren
Waterloo, Iowa

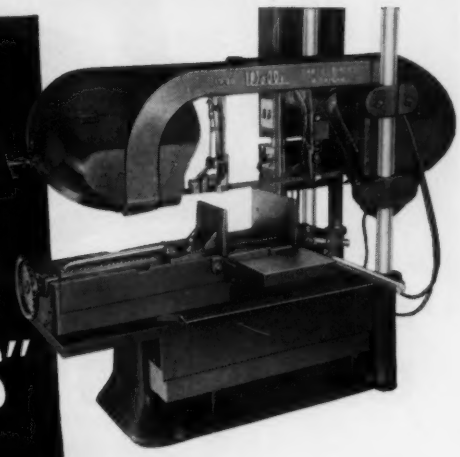
•

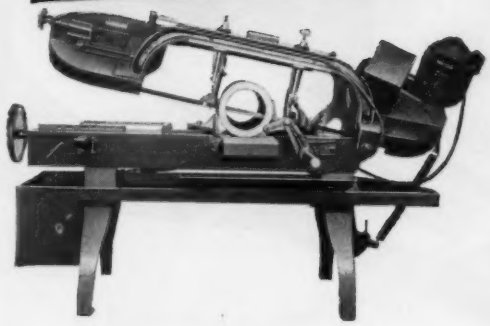
IN A WELL MANAGED COMPANY — one which gives the proper tools to its supervisors to work with — it is not necessary to take the approach that Ed is following. First, a good foreman, or in fact any supervisor, should, without obviously making it apparent, know what his men are doing. Certainly the little black book went out with the efficiency experts. If you are a supervisor and don't know whether your workers are giving you a good day's work for the pay being given, then you better supplement your own knowledge and study supervision.

It is admitted that there are certain pieces of information which one must have to make decisions and judge workers. To get this data one of the best methods of approach is to use some form of work report. This will show the job number and hours applied to that job. From this data, and knowing yourself about how much time a worker should spend, you have a control over the individual far better than your "black book." Usually the job is estimated by someone familiar with the work, and you have these hours to guide you. Then you have the worker's actual report of time to compare against it. Yes, sometimes trouble does make the job drag out, but you are always aware of that, for you must on these cases give additional assistance to your employee. So without a lot of red tape you get a series of reports which tell you far more than a walk through your de-

METAL "CUT-OFF" becomes a preferred job . . .

with rugged dependable "WELLSAWS"





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The Pioneers of Horizontal
METAL CUTTING BAND SAWS
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"Best in the long run"
WENDT-SONIS CARBIDE TOOLS

Wendt-Sonis carbide tipped tools are *"Best in the long run."* Best, because they give you smoother finishes . . . allow faster feeds and speeds . . . and require less sharpening.

These cost-reducing advantages are built into all Wendt-Sonis tools. Wendt-Sonis selects the highest quality materials . . . assembles them to give you the finest tools available. For example, Wendt-Sonis carbide is quality controlled for absolute uniformity. Carbide is brazed to the tool bodies by the exclusive Wendt-Sonis "slow braze" process to insure a strong bond.

The complete line of high quality Wendt-Sonis carbide tipped tools, blanks and inserts are available at your local industrial distributor. Buy through him. His personal interest in your needs, plus his nearby location and training will mean savings for you.

Write Dept. AM-555 for catalogs and the name of the nearest distributor.

WENDT-SONIS
Hannibal, Missouri • Rogers, Arkansas

partment, and are more reliable.

Remember that you are only at one point for a matter of a few minutes. You have to admit that no individual can work continuously without stopping. Haven't you been in that position with your boss? He walks in just after you have been struggling with your production schedule and finds you relaxing slightly. Sure you have. We all have. Suppose — and some top level supervisors do, unfortunately—he judged you only on that one contact. He would have you fired for loafing. Yet you work harder than most foremen but are always unfortunate in having him come in when you have just finished a job or are just getting ready to go out onto the floor.

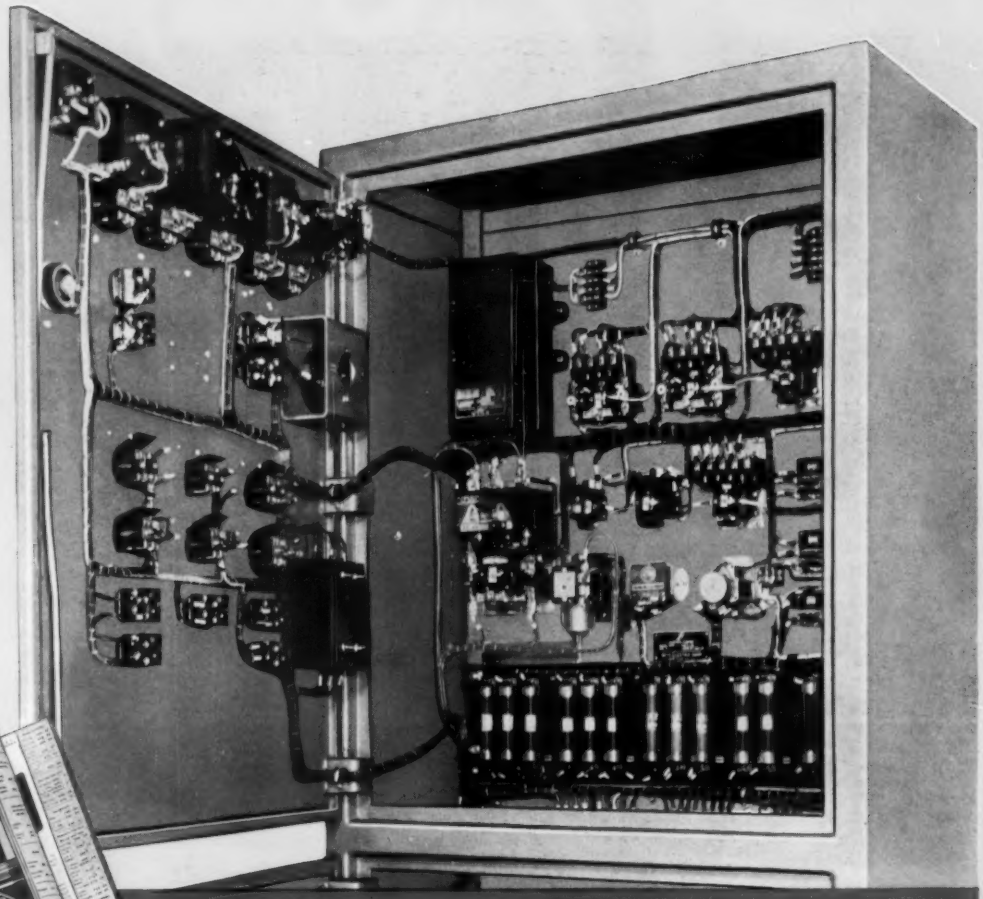
No indeed, fair judgment of a man's work does not come from the brief minutes of contact that you have with each worker. It comes from the day's work turned out. Maybe your worker has abilities far beyound his present line of duty and can accomplish his work quickly, thus having some spare time. Perhaps he doesn't want to show up those less fortunate and thus he lags his operations, all in order to keep in pace. Yet in the day's time he turns out more than the rest. How can your black book show that? Better play it real safe and set up a measuring device which will tell you more accurately than your black book just what the workers are doing in a day's time. It is the total production that counts, not that of any one minute.

Yes, there is such a thing as being too soft. You can close your eyes to things that happen but it won't be long before you will be looking for a new job. In supervision you must ride the center line and do those things which will place the company in the best position to meet competition.

You don't have to know it all. You have today many specialists to aid you. There are many worthwhile foreman or supervision courses.

The Sign of
QUALITY
MOTOR CONTROL

Control panel for BETA dust precipitator rectifier, shown below with door closed. It has 3 Bulletin 709 starters, 2 Bulletin 700 relays, Bulletin 702 contactor, and Bulletin 809 overload relay. On door are 20 Bulletin 800T oiltight push buttons and pilot lights.



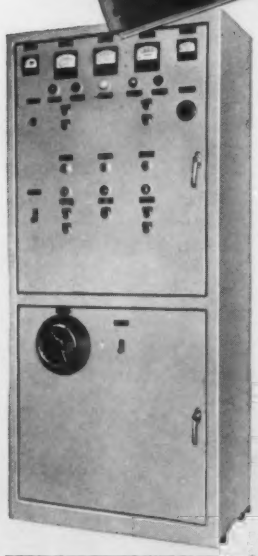
MANUAL and AUTOMATIC COMPONENTS for *Trouble Free* Control Panels

Automatic control panels must be reliable . . . not just MOST OF THE TIME but ALL OF THE TIME. The failure of only one component . . . JUST ONCE . . . may be costly in spoilage and production delay.

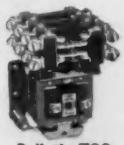
A-B controls continue in first place in dependable switching because they are so simple. They have no troublemaking pivots, pins, or bearings to gum up and stick. Their double break, silver alloy contacts never require maintenance until all contact material has been worn away.

Specify Allen-Bradley controls for your machines. Send for the A-B Handy Catalog.

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd.
Galt, Ont.



BETA dust precipitator control cabinet with A-B oiltight push buttons

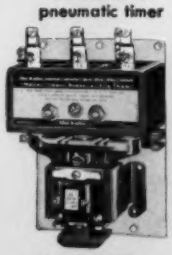


Bulletin 700 universal relay

Bulletin 609 manual starter

Bulletin 709 solenoid starter

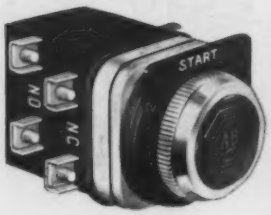
Bulletin 849 pneumatic timer



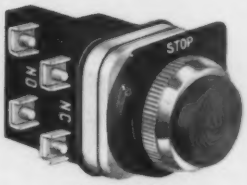
Bulletin 702 Size 2 contactor

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

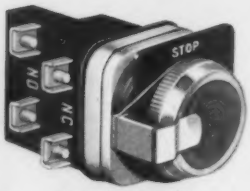
5-55-R



Start button

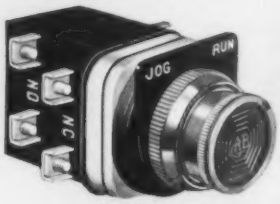


Stop button



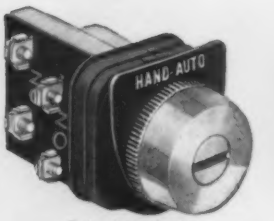
Stop button with locking attachment

Mushroom head button



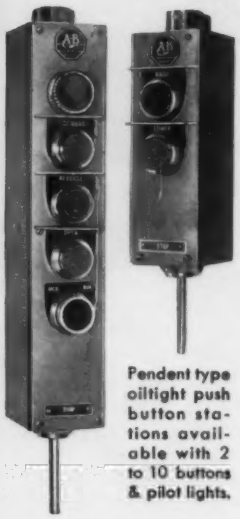
Jog button

Selector switch



Coin slot selector

Open view of 2-button oiltight master station showing method of mounting

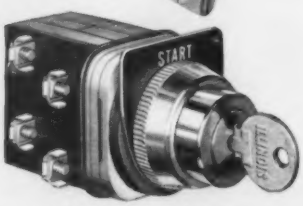


Pendent type oiltight push button stations available with 2 to 10 buttons & pilot lights.

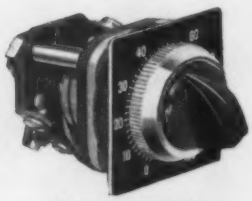
ALLEN-BRADLEY OILTIGHT PUSH BUTTON LINE

that *Satisfies Every Requirement*

Jog button with Start button and Stop & Jog lever



Cylinder lock button



Potentiometer unit

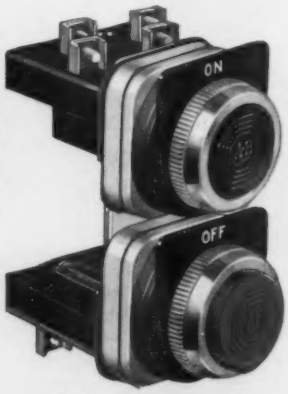
Pilot light Transformer type

Here are a few Allen-Bradley oiltight push button units for machine tools that can be used in endless combinations. All have a flexible, oiltight diaphragm between button and contact block to exclude oil or cutting fluids from contacts. The silver contacts are maintenance free.

Contact blocks may be assembled interchangeably with any type of button. They are available with 1 NO-NC; 2 NO-NC; 4 NO-NC; 2 NO; or 2 NC contacts. Pilot lights of matching design are standard items. See the A-B Handy Catalog for details.

Allen-Bradley Co., 1316 S. Second St. Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.



Two-button maintained contact button

5-55-RM

A-B Quality

ALLEN-BRADLEY QUALITY

BULLETIN 800T PUSH BUTTONS

Learn how to be a good supervisor and don't think no one can help you, for a specialist can many times make your work easier and get you an advancement. He is not looking for your job.

Charles D Townsend
West Hartford, Conn

•

ED'S IDEA of going around his department and making notes on the activity of his men sounds like going back to the dark ages of the so-called scientific management era. This is not a criticism of Frederick W Taylor, who honestly tried to get more money for workmen when they did good work. But some of his misguided followers tried using stop watches in secret hiding places where the men could not see them, or so they thought. Few of them succeeded in fooling the men.

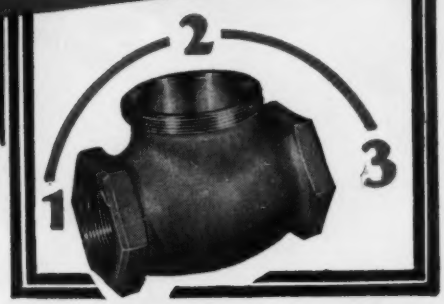
In reality very few, if any of us, turn out the last ounce of our possibilities every day. We all have off days both from personal fatigue, illness, or pure cussedness. If we all worked to the last ounce of possible effort there would be much more time lost during the year. And the morale would be greatly impaired. Aside from the physical or mental fatigue, how many of us would stand for the MP or chain-gang treatment? Does even Ed always give his whole mind and effort to his job for the eight hours he is in the shop? Doesn't he let his alleged mind wander sometimes to thoughts of hunting or fishing?

Theoretically, perhaps, a man should devote his whole eight hours, or 480 minutes for five or six days a week, to his job and not think of anything else. Practically no one does it; not even Ed. When they do they belong in the robot class, and even robots have downtime.

When men are constantly watched they learn how to *seem* to be busy, without really turning out the standard amount of work for the hours put in. One of my old foremen —a working foreman in those days, as was common in small shops years ago—could turn out more work with less apparent effort, than any man I ever knew. He never seemed to be in a hurry, and Al would have marked him down as not being on his toes. Al would have probably noted how long it took him to light his pipe, or chat with his men. But he turned out a lot of work, and so did his men.

Wage incentives, based on the amount of work of standard quality,

ALL ENDS OF PARTS
Completely Finished
"1·2·3"
ON THE
GOSS *and* DeLEEUW
Automatic Chucking Machine
in 1 SET-UP

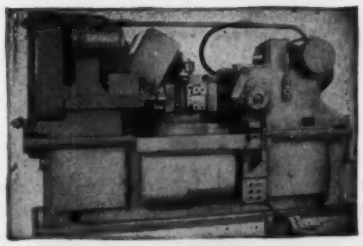


This recent Goss & DeLeeuw development has already received universal acclaim as an outstanding development.

In speed, ease of tooling and precision finishing, the "1-2-3" chucker provides engineering advantages which result in vastly greater production at a fraction of parts' costs by other methods.

Easy, fast change-over from job to job makes this machine ideal for short-run requirements. Sturdy construction, power and speed make its advantages apparent on long runs.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence — a method exclusive with Goss & DeLeeuw and offered on this machine.

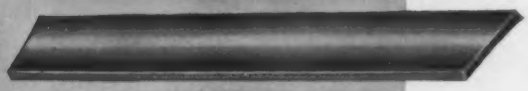


Illustrated literature available promptly on request. Send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

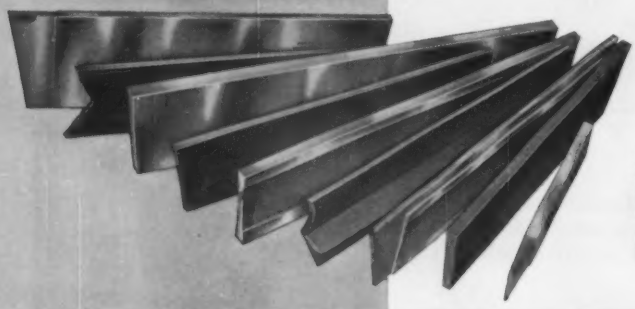
GOSS *and* DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

CUT-OFF BLADES



JCO BLADES

T-CUT BLADES



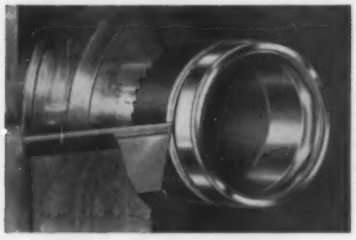
Plus

SCORES OF SPECIAL BLADES

DESIGNED FOR HIGH SPEED OPERATION

When it comes to that toughest of all metal cutting jobs . . . the parting-off of work . . . you can't do better than choose from the complete line of Pratt & Whitney Cut-Off Blades.

Made from selected, specially purchased steels, they are carefully heat-treated. This provides maximum toughness and resistance to chip abrasion and wear. Also permits the use of minimum widths for stock conservation with ample rigidity and strength to resist flexing and breakage. Exceptionally fine grinding finish plus a distinctive surface hardening treatment means longer wear life.



Used singly or ganged together . . . Pratt & Whitney Cut-Off Blades are your best bet for improved performance and lower production costs. Be convinced; try them on your next job!

First Choice for Accuracy

PRATT & WHITNEY

DIVISION NILES — BEMENT — POND COMPANY

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☐ Please send me Cut-Off Blade Circular No. 561.

NAME _____ POSITION _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE _____ STATE _____

MACHINE TOOLS • CUTTING TOOLS • GAGES

will do more to increase production than Ed can possibly do with his little pad and pencil. I know there are too many men who try to get by with as little work as possible. But efficient time study, in cooperation with the men themselves, and good working conditions, will accomplish more than the implied threats of Ed and his pad of notes. You don't get cooperation by swinging a big stick or a pad supposed to be full of a man's short comings.

Fred H Colvin
Point Pleasant, NJ

•

SPOT DEMOTION

Should the foreman explain to a worker his reasons for shifting him from one machine or job to another? Will such an explanation eliminate misunderstanding and resentment, or is it unnecessary?

I HAVE NOTICED TIME AND TIME again where the foreman has been severely criticized by workers for things he has done in the regular line of duty. These self-styled judges didn't seem to realize that what the foreman did was decidedly none of their damn business.

Such a thing as shifting a man from one machine to another should not require the approval of the individual concerned, unless for some reason it was obvious that there was marked discrimination evident. In such an event a man is justified in blowing his top to know the reason why.

Browning seemed to be unnecessarily put out when the foreman took him off of a machine which he felt was his very own so long as he wanted to operate it. It has always been my policy to shift the workers around so as to preclude the possibility of a tieup in the event of an emergency—when the "indispensable" decides to gum up the works by his absence.

An executive has a hard-enough time of it without having to ask his men just what to do, or try to please them every time he does something. If, in his opinion he thinks it is going to benefit production by changing the men around, that's the way it should be. I take the same stand as does Ed. If he says to his man, "Here, Mulligan, you take over the American; I'm putting Herrman on the jig-borer for a spell," he has no reason for telling the belly-acher why he is making the shift unless,

of course, the man happens to ask.

I had an Englishman with me some years back who would thrill any foreman by his pleasing acquiescence to work assigned to him. "Just as you say," he would reply when given orders to do something. He was a good mechanic, went about his work in a business-like manner, and above all, he attended to his own business.

Harrison Mitchell
Topeka, Kansas

•

STABLE WORKING CONDITIONS in any shop are a valuable asset to all concerned. Being kicked about is very detrimental to efficiency everywhere. A good leader does not act as Ed in this case; instead, he always looks ahead to prevent such calamities as finding it necessary to take men from their ordinary jobs and placing others to do their work.

I don't blame Browning for being mad at Ed when he demoted him from the jig borer. Before he ordered him to the jig borer Ed should have investigated whether he was capable of running such a difficult machine. If Ed placed Browning at the jig borer without first convincing himself that he was a suitable man for the job, he should be blamed, not Browning.

It looks to me as if Ed never considered Browning as a possible and capable man for the jig borer when he is ready to replace him at any time. It would have been better never to put him at the jig borer than to place him there and remove him with the suspicion that another man is better. Why didn't Harmon get that job in the first place? That would have saved many a headache for Browning.

I would do the same thing as Browning — look for another job —

"We hired her as part of our accident prevention program."

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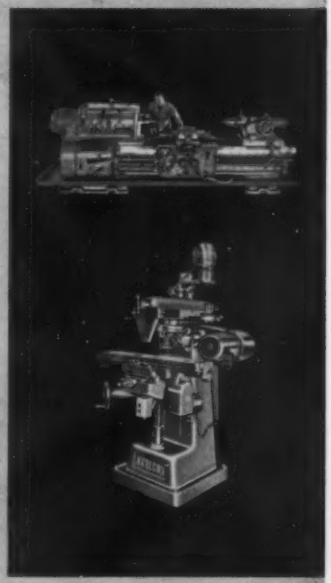

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if I were treated the same as he. It would hurt me deeply if Ed told me I would be removed from the machine I had run previously, unless, of course, I had made some serious mistakes that would justify my removal. And due to the prosperous times we have had for the past 15 years or so with lack of skilled labor, I think any foreman should think twice before he makes changes that are looked on as demotions.

Perhaps Ed is trying to prove that he is a strong man by kicking his men about. If that is the case, he is behind times and should be reported to management. As Browning evidently is not even worth an explanation as to why he was getting shifted, he should ask the Big Boss to make an investigation. If such an explanation is not given there will be union trouble, not only in this case but every time when a guy is moved about in the future. On the other hand, if it is true that Browning has fouled up two jobs I should like to know how serious these mistakes were. If the company lost a lot of money, there will be no objection if he is removed from the jig borer and given such jobs as he is able to handle. But as Ed does not state how big the losses were, perhaps he is trying to use two small mistakes as stepping stones for his own interest instead? Any punishment should be in proportion to the mistakes made. All this should be explained.

If Browning and other men are shifted to get wider experience, the proposition is entirely different. No objection can be raised against such arrangements — it is fair to everybody. But why not tell Browning about it? I doubt Ed is sincere on that point, otherwise he would have explained the matter to him. Ed says

"Hold it!—We're merging."

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A Michigan manufacturing company broaching 4140 Steel in a horizontal machine found their broach life unusually *low*. The machine shop superintendent tried a number of oils recommended by various companies, but found none satisfactory either for increasing tool life or producing the desired finish. On a routine call, Sinclair Industrial Representative M. L. Howland was asked for his recommendations.

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Mr. Howland reports, "Overheating was the reason these tools were taking a beating. Examination showed the need for an oil with proper anti-weld, extreme pressure characteristics and correct viscosity. From previous experience, I recommended Sinclair ORDNANCE B, a heavy duty cutting oil."

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Mr. Howland continues, "Following my recommendations, the superintendent tried Sinclair ORDNANCE B on a test basis. On a follow-up, I learned that the broach life had been *doubled* and the finished pieces were free from tool marks. The company now specifies Sinclair ORDNANCE B *100% for its broaching operations.*"

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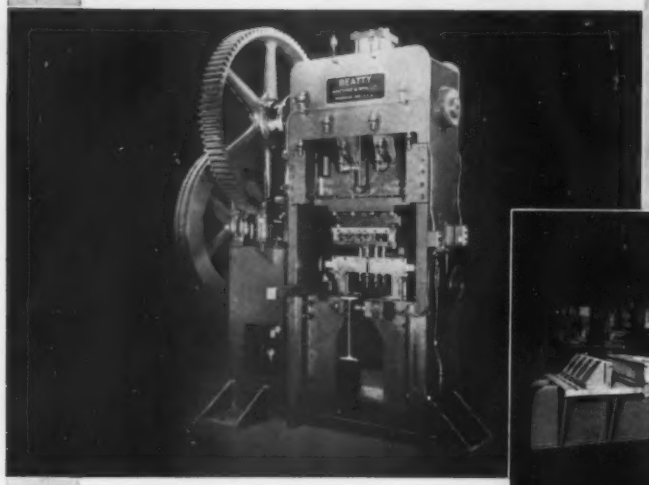
–punches flanges in "I" and WF beams!



BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging and bending.

Here's a new versatile Beatty machine that is ideal for the structural steel fabricator who runs a miscellaneous job shop and requires frequent set-up changes. The new guillotine beam punch, with 200 ton capacity, features built-in adjustable tools for flange punching "I" and Wide Flange beams. A turn of a handwheel provides quick change of punching centers and synchronizes punch with die at the same time. These tools consist of two frames which open and close about the center line of the beam. It has four punching units; minimum inside setting is 2¼", maximum 6¾". Centers between inside and outside punches can be adjusted from 2¼" to 3½". For specific details on improving metal fabricating production—consult your Beatty engineer!

BEATTY Guillotine Beam Punch. Punches webs and flanges in "I" beams from 6 to 30 inches.

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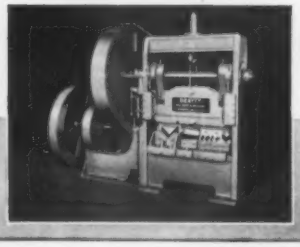
BEATTY Gap Type Press for forming, bending, flanging, pressing. Capacity 250 tons.



BEATTY Guillotine Bar Shear for angles, bars, rounds, squares without changing tools.

he doesn't want to hurt a man's feelings by telling him why he is being removed from his job. It is a surprise he doesn't realize that he is hurting any man far more by not telling him why he is getting shifted.

A E Fristedt
Stockholm-Bromma, Sweden

•

No ONE LIKES to work for a company which sets up regimental rules for the employees, demanding that each do as he is told without asking any questions or objecting to moves made by the foreman.

Nowadays supervisory employees are trained to look on the men under their supervision as part of a team, working together. Each man should know what is expected of him, and why. Each should be free to discuss his job with the foreman, to suggest improvements, such as better methods, or tools to be used, or safety measures to be taken for the benefit of all.

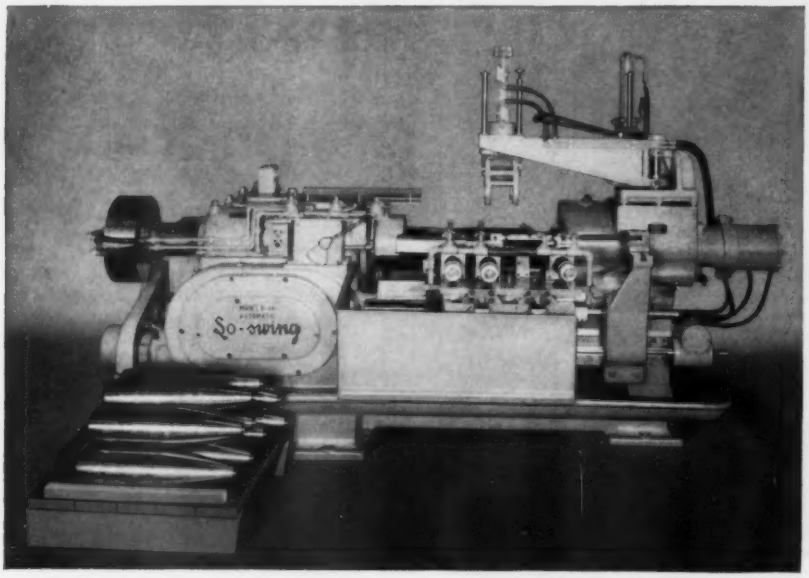
Under such a system there is seldom friction between the foreman and the men under him. If the foreman moves a worker from one machine to another, the man understands why the move is made. If he doesn't understand he will not hesitate to ask why he is being moved, whether he has done something wrong; he may discover that he can make a better contribution to teamwork on some other job.

In the Browning case Ed is wrong. He is of the old school, where the foreman considered himself as tops; no one could question his authority; whatever he did was right. A man like that in a manufacturing plant is a liability because he will not have the men working with him; it is poor policy to have men simply

"Oh, I guess he's not a bad egg once you get to know him . . . However, I never have, . . . and I'm his son."

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



MODEL R-14 Lo-swing AUTOMATIC LATHE equipped for loading and turning 155mm shells.

MODEL R-14 Lo-swing LATHE FINISH TURNS 155mm SHELLS AT HIGH PRODUCTION RATE

PROBLEM: To finish turn the contour of 155mm shells and provide other than manual means for loading and unloading work.

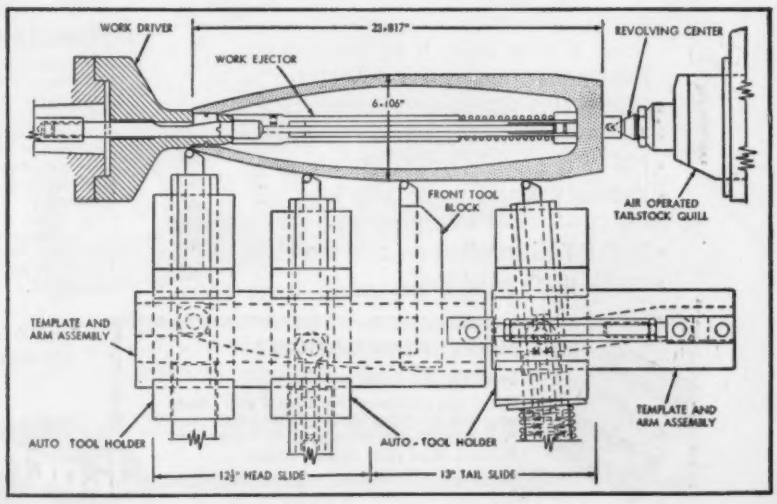
SOLUTION: The Model R-14 Lo-swing Automatic Lathe was selected for this job as it provides the necessary rigidity and power to handle multiple cuts at high cutting speeds with carbide tools.

The line drawing shows the heavy duty contour turning attachments and the two-step template used for duplicating the profile of the shells. The shell is driven with a special air-operated, three-jaw driver and is located from the finished face of the nose.

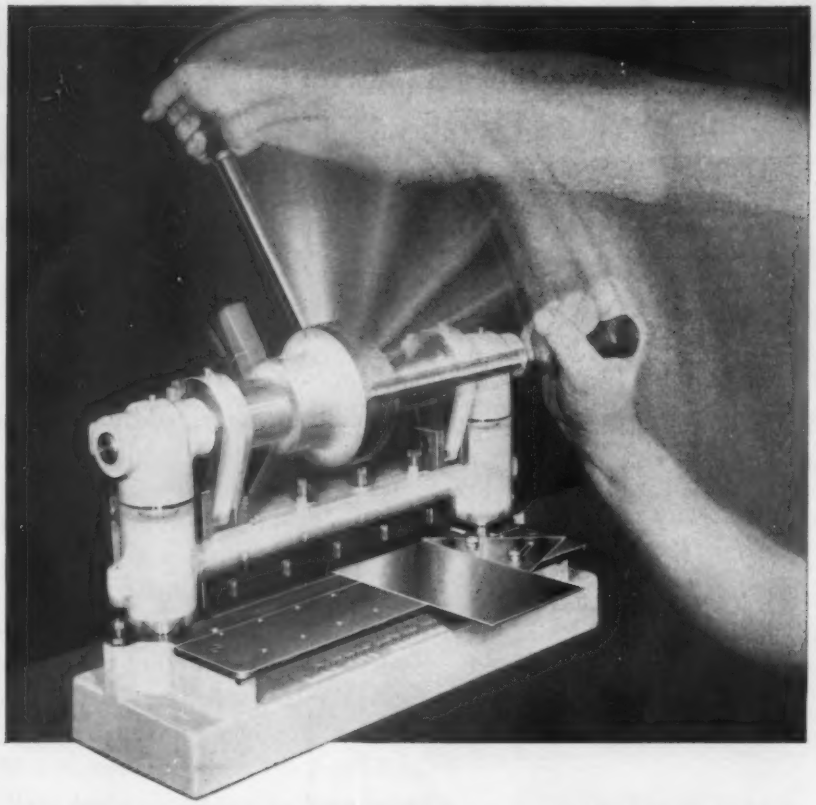
The shells which are too heavy to handle, are loaded and unloaded with a double-arm, pneumatically-operated loader. Rough shells are delivered at the rear of the machine on a conveyor. In position No. 1, one arm of the loader is directly above this conveyor and, when lowered, picks up a rough shell, while the other arm picks up a finished shell from between centers. The operator then throws the air control valve, which raises the loading device and swings it through 90° to No. 2 position, delivering the rough shell between centers and the finished shell to a second conveyor, located at the front of the machine, which leads to the next operation.

The shells are automatically released from the driver nose by a spring loaded ejector. In operation, the loader fingers are first clamped around the finished shell and, as the tailstock center is retracted, the spring loaded ejector forces the shell clear of the driver nose.

Seneca Falls engineers are at your disposal for a solution of all turning problems.



PRODUCTION COSTS ARE LOWER WITH Lo-swing



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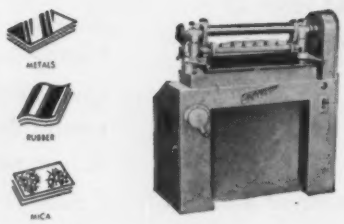

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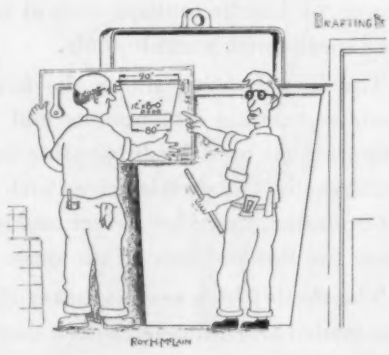
working *for* him. Neither Browning nor any other self-respecting man will stand for being moved around like an automaton, without knowing the purpose or reason for the move.

Michael Axler
Los Angeles, Calif

•

I THINK ED is aware of having handled a simple, everyday happening in a timid, slipshod fashion and, as a consequence, he is sensitive about very natural comment by Al. His reason for deciding to move Browning from the jig borer is a perfectly legitimate one, calling for no evasive action on his part. If Browning was spoiling work and taking a long time to do so, naturally Ed would be compelled to do something about it. Demoting or appearing to demote a man is always a disagreeable part of a foreman's job, not made easier by equivocation. If a foreman demotes a man unjustly, the matter of explaining such action could be a cause for misgiving in the foreman's mind, but since Ed was justified in making a change, there was no good reason why he should not have explained to the man the true cause of his removal. In the event, that is always the shortest and least acrimonious way to handle a reshuffle.

If the foreman has a good case, and if he has explained it truly and politely to the operator concerned, the man has no grounds for a "comeback" on the foreman. If the man to be demoted is a good citizen whose only fault is lack of experience on a given machine, the foreman should handle the situation truthfully and sympathetically. It is only natural that what seems to be demotion should be a disappointment to the man, the more so if he is eager to succeed and make a name for himself. To my mind, Ed has been rather high-handed with Browning, and he



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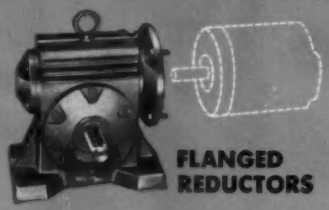

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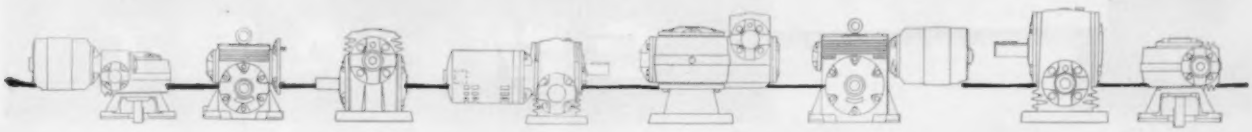

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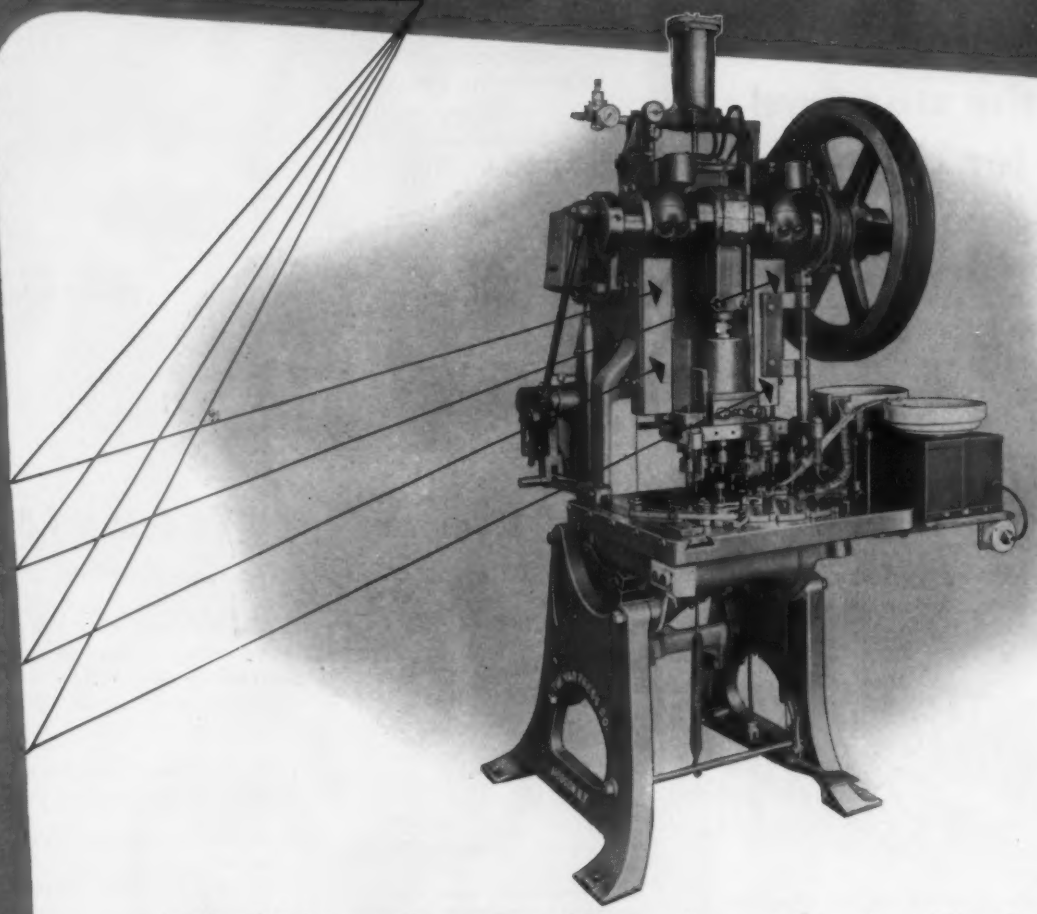

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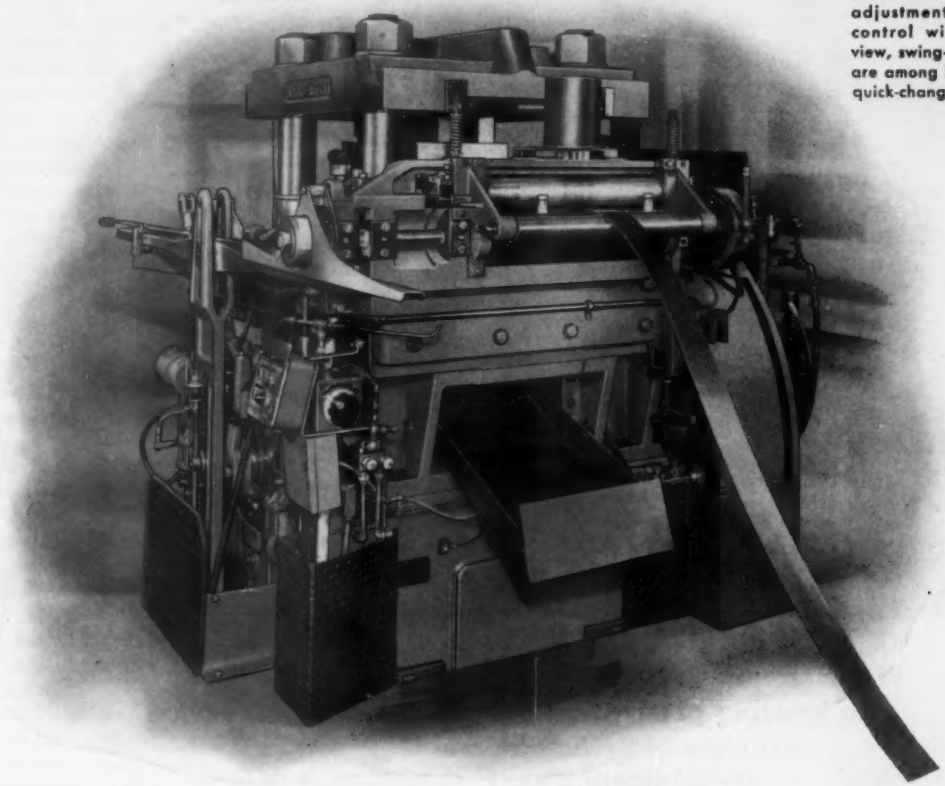

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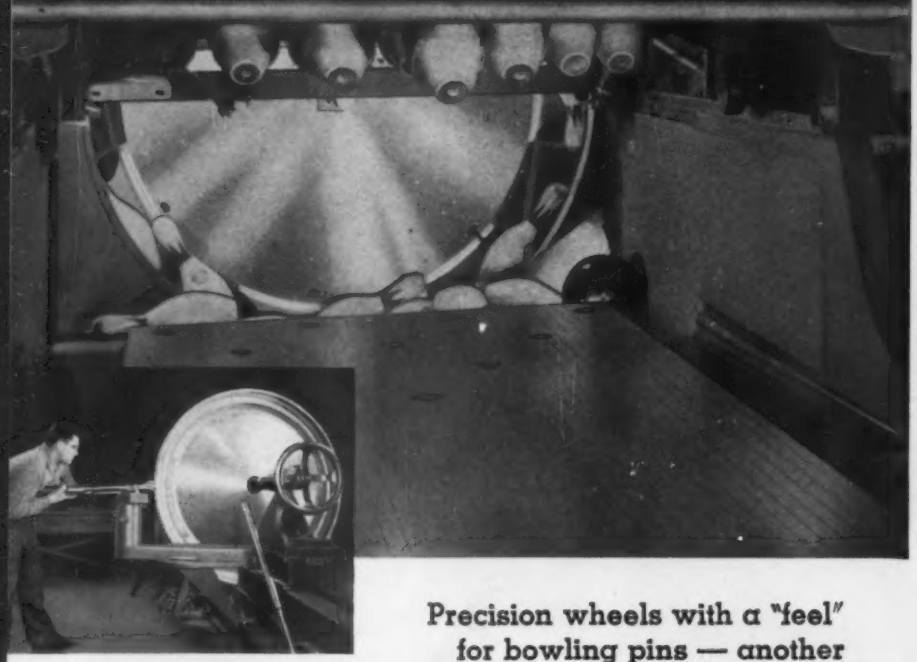

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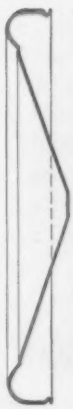

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is suffering for his sins. It never pays, and Ed's rather testy replies to Al's questions would seem to indicate that he is aware of his folly, but is pig-headedly prepared to bluster his way out, and fight to the last Browning. He is being unnecessarily aggressive about a little, commonplace, everyday happening in a foreman's life which, handled with sympathy, tact, and ordinary courtesy, could have been "passed into law" without a division.

The moving of operators around the shops can be the cause of much discontent; we are mostly all so much creatures of habit. Not every operator likes change; many detest it, some yearn for it, and while selective moving is, generally, in the interests of the men, the company, and the foreman, indiscriminate changing around can be the cause of much trouble. In that connection, I confine my activities to moving around those operators who prefer an occasional change of work, and I specially note all who, from time to time, express a desire for more variety. I find this to be a paying proposition, since grouses don't normally come from people who are getting what they want, or ask for.

On the whole, I can always muster as many willing, versatile operators as are normally required for "stand-in" purposes, and the selective scheme has actually been responsible for some of the mildly opposing ones who were never asked, suggesting to their foreman that they might be considered for inclusion. When those stand-offish ones unbend to that extent they are enrolled and given a try-out. Quite 80% make the grade; the remainder usually say they don't like being changed around, and ask to be allowed to revert to their original routine. Thus, everyone is happy, no one who doesn't want to is asked to change around, and all who express a desire for change have their wish gratified as soon as circumstances permit.

E MacNaught
Glasgow, Scotland

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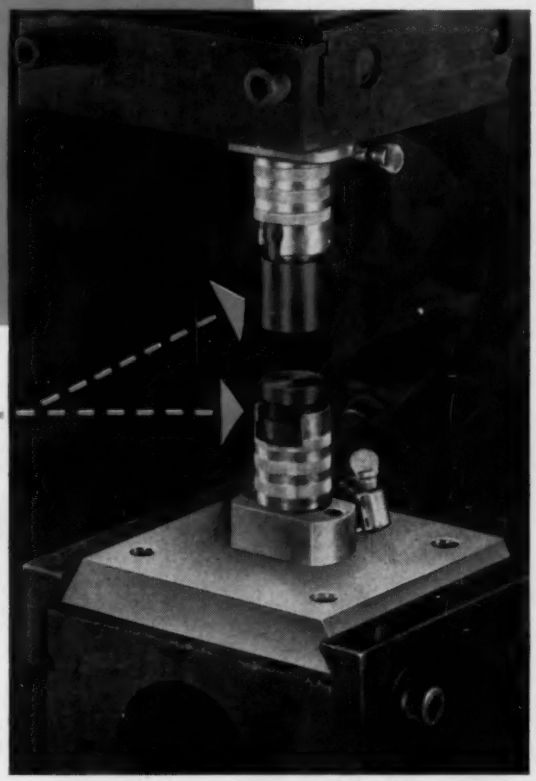

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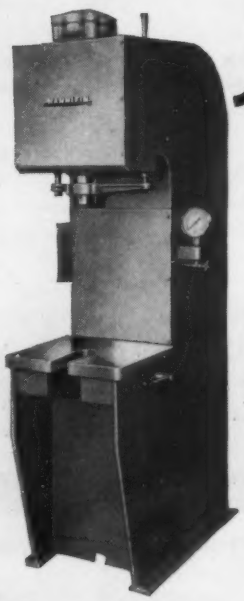

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A SPOT DEMOTION without explanation not only puts the affected worker on the spot, but the foreman as well. This unfortunate action, with its narrower prospects for the future of the worker, should be coupled with as full and frank an explanation as possible by the foreman, in all fairness to the demoted employee.

However, before any demotion is finally undertaken, a full canvass of possible alternatives should be made; complete knowledge of all the facts is essential. It should be borne in mind that demotion is a serious blow to the individual's self-respect and his status among his fellows. Transfer, counselling, additional training, or some other approach may solve or mitigate the problem. A primary object should be to take action which will incur a minimum amount of resentment on the part of the employee and his fellow-workers.

In the case under discussion it appears that the foreman felt that demotion was necessary because the individual was unable to perform the high-precision work satisfactorily. However, it was unfortunate that the change to a lower position was made abruptly without prior explanation to the worker. The foreman's lack of good judgment was clearly indicated in putting the man on the jig borer without adequate training and supervision. Under these circumstances the spot demotion was an act of injustice with consequent damage to the morale of the worker and unnecessary embarrassment to all concerned.

Demotion because of inability to handle a work assignment would be unnecessary if the worker's shortcomings had been detected during indoctrination by an alert foreman.

"Prob'ly all right if a fella stands up all tha time. . . ."

Injudicious and inconsiderate demotions, with brusque notification, either written or spoken, usually create in an employee feelings of resentment, failure, and inadequacy which can do much to upset his future work for the company, and are certain to make him anything but a good advertisement for the personnel policies of his employer.

The foreman should have called the man in for a private interview and explained why the urgency of the assignment and the special skill required for the job made replacement of operators necessary, and demotion unavoidable. By this course of action the adverse effect on the employee would have been minimized.

The foreman as supervisor certainly has the right to shift his men around to suit the exigencies of his work schedules, or to give his men varied experience on different machines. The fault with the foreman in this case stemmed from the manner in which the shift was made. I believe in shifting men around to make them more valuable through job rotation. It makes the foreman's job easier by having his men able to run different machines in his department. It is also beneficial for the worker to be able to operate more than one machine. It makes them more versatile and valuable to the company. However, the rotation of workers should be the foreman's prerogative. He knows which schedule dates are tight, and the best man to put on the rush job. Where a jig boring job in the hands of a less experienced man might result in missing a scheduled date, or possibly fouling up the job, it is the foreman's duty to set aside the rotation plan and put the better man on the job.

From the facts in the case, I am inclined to think that Browning is enlarging the situation in his own mind. Anticipation of going back to his old job as grinder is producing stronger emotions than realization. The thought of having a tooth drilled very often causes more distress than the drilling. As far as the foreman is concerned, he really has nothing to be afraid of; he has to get a job done. He should tell Browning the facts of the case in their proper light in a calm, detached way without apologies and without any loss of temper. When a situation like this is approached intelligently, very often the foreman can give the worker a peg to hang some hope on. No situation is ever so bad that it doesn't have some good aspects. Here, for example, the foreman might have said, "We are shifting you back to your old job at this time, but only

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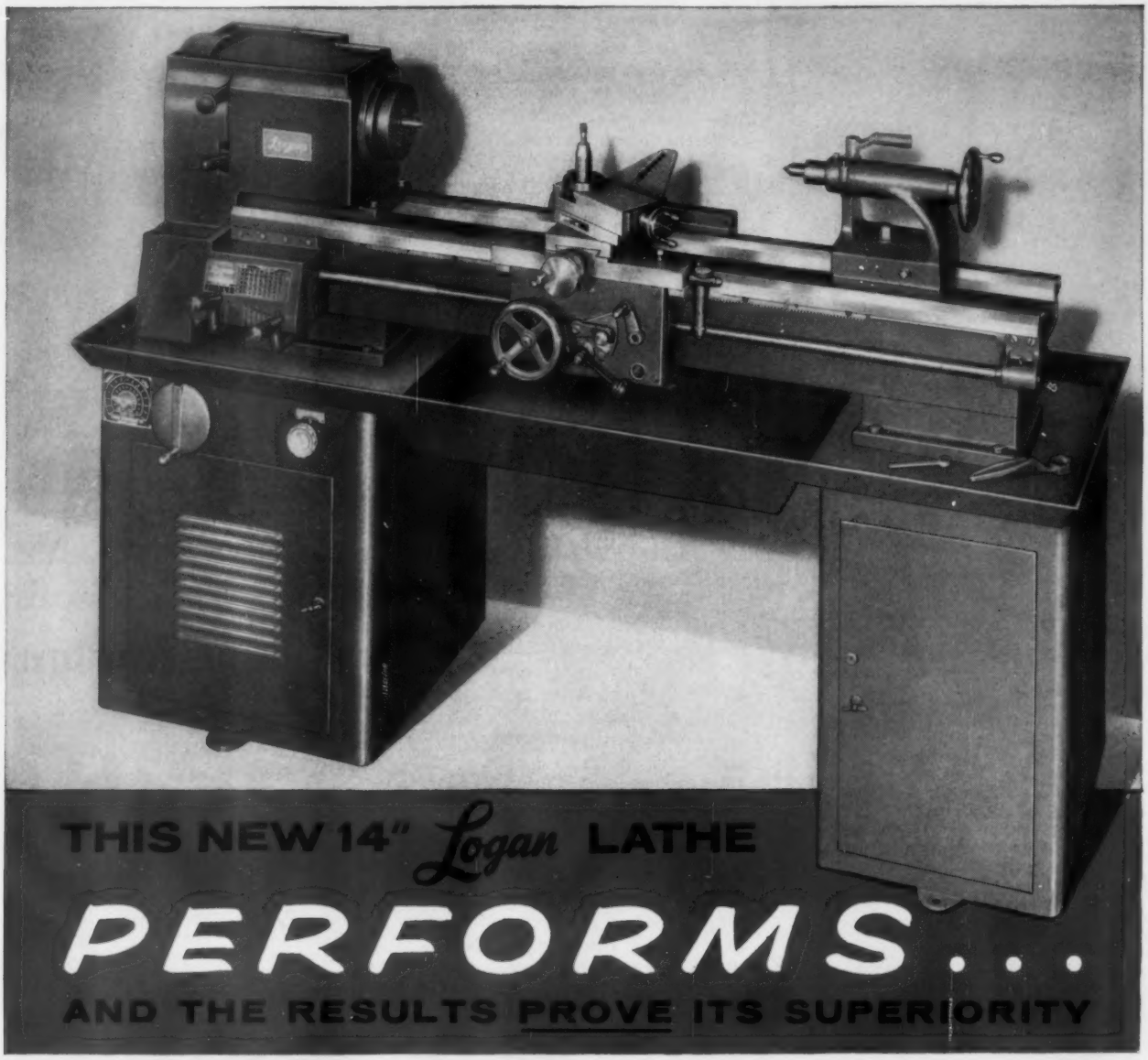
temporarily. But we don't want you to feel that the door to promotion has been closed. You should merit future promotion as time progresses." He also could have told the worker that the job wasn't right for him and it was better for all concerned to wait to find a job for which he was better fitted. If both foreman and worker are realistic, if they face the facts, then it will not be difficult to step up to any situation, whether it be work, responsibility, or human relations. Frankness and honesty in dealing with personnel and work situations are the best means of approach in handling them properly.

The degree to which workers have categorized jobs in an organization with respect to desirability has a great deal to do with their readiness to accept personnel adjustments. Status is a vitally important factor in job satisfaction, and should be given serious consideration by management whenever transfers, promotions, or demotions are being contemplated. Monetary compensation, while important, frequently fails to outweigh status as an incentive. There are numerous cases in which the same pay is given, and substantially the same working conditions obtain for two jobs, yet the type of work, or the organizational level, or some other factor in one of them causes the employee to class it much lower than the other in the scale of prestige values. Transfer to such a job, even temporarily, may be resisted with unexpected and unaccountable vigor.

Whether or not an unexplained demotion is called by another name, the blow is not softened by clothing it in the respectability of a job shift, or rotation plan. "A rose by any other name" might smell as sweet, but a seemingly unwarranted and unexpected spot demotion has an odor of poor management.

Harry Kaufman
Philadelphia, Pa

"Boy! that must have been some suggestion that Bently turned in."



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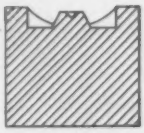

A look at the profile of the intricate hole machined by this W&S counterbore is a look at Woodruff & Stokes' specialty—designing and producing small precision tools to do *in a single operation* work often requiring many separate machinings with their attendant loss in accuracy and time.

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PASS-ALONG PRAISE

If the supervisor congratulates a foreman on a job done in his department, should the foreman name the man who worked on the job, or is it sufficient to simply repeat the praise to him later?

THE USE OF PRAISE in a plant, or in fact anywhere, should be backed by merit. Here Al has a point. Perhaps Jones wasn't entitled to any praise, but it is also equally true that Al wanted to appear the big shot of his department and keep all the praise to himself. This time it backfired, as it most always does. We have individuals around us who virtually live on praise. That is the type of person who cannot admit that it isn't their work alone that caused the praises to be sung. They are the persons who cannot share anything in life.

Perhaps Al is of this class. Men get to be foremen and even vice presidents who cannot or will not share the praise of getting a job done with those who are responsible for its achievement. True, perhaps, without Al the job would have flopped, but undoubtedly someone else would have come up with a similar idea.

It is a sad picture in a company to observe supervisors, foremen, and even factory managers each taking credit individually for the entire job when their superior hands out a morsel of praise. Too often these companies begin to lose their footing and fall by the wayside. No company can exist with a setup whereby each person does his own job as a separate job, and there is absolutely no coordinated teamwork. No company can expect its foremen to properly handle themselves if the pattern is not laid down for them by the actions of higher officials in the organization.

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It is not always the fault of a foreman if he does not adjust himself to the ways of doing things properly and in line with usual company procedure. After all, too frequently he was grabbed from the ranks and made a boss. He probably received no training for his job, and instructions on company policy were not given him. He had to make his own way. He copies his superiors. He believes as they do, for to him they are what the company believes and they represent how it is supposed to be operated.

So perhaps Al has a reason to react as he does. Maybe he has heard Harrison receive praise for a job that actually he himself (Al) has accomplished. Not Al alone, but the team directed by Al. If only we could get our industrial organizations to think in terms of teamwork, and each supervisor as the captain of that section of our all-out, over-all organized team, we could achieve many things.

It is always wise to give credit where credit is due. It would be wise for any foreman to establish such a policy in his shop. It is not necessary to broadcast to the big boss that Jones did the job, but it is well to call Jones in and in some small measure pass along some of the glory. After all, who actually did the work? It was Jones, not Al. Al cannot succeed without the many Jones's under him producing. Therefore, harmony is essential and praise builds for a better understanding.

Always remember that if you like praise from your boss, then give credit where credit is due. He knows you are not the actual doer of the deed in all its details. He knows that it is under your guidance that the

"He'll never know what hit him!"

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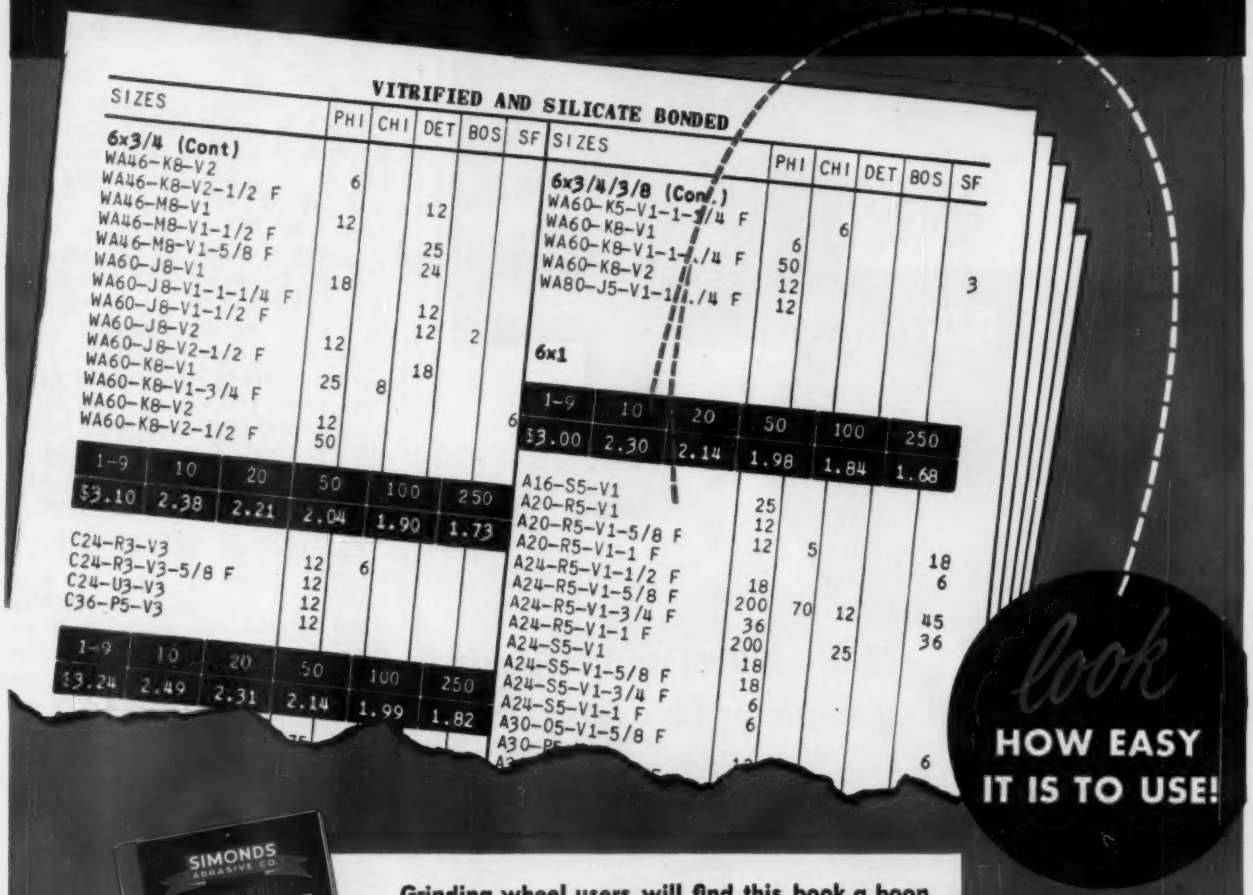

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WA60-K5-V1-1-1/4 F	6	6			
WA60-K8-V1	50				
WA60-K8-V1-1-1/4 F	12				3
WA60-K8-V2	12				
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6x1					

1-9	10	20	50	100	250
$3.00	2.30	2.14	1.98	1.84	1.68

A16-S5-V1	25				
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A20-R5-V1-5/8 F	12	5			18
A20-R5-V1-1 F	18				6
A24-R5-V1-1/2 F	200	70	12		45
A24-R5-V1-5/8 F	36				36
A24-R5-V1-3/4 F	200		25		
A24-R5-V1-1 F	18				
A24-S5-V1	18				
A24-S5-V1-5/8 F	6				
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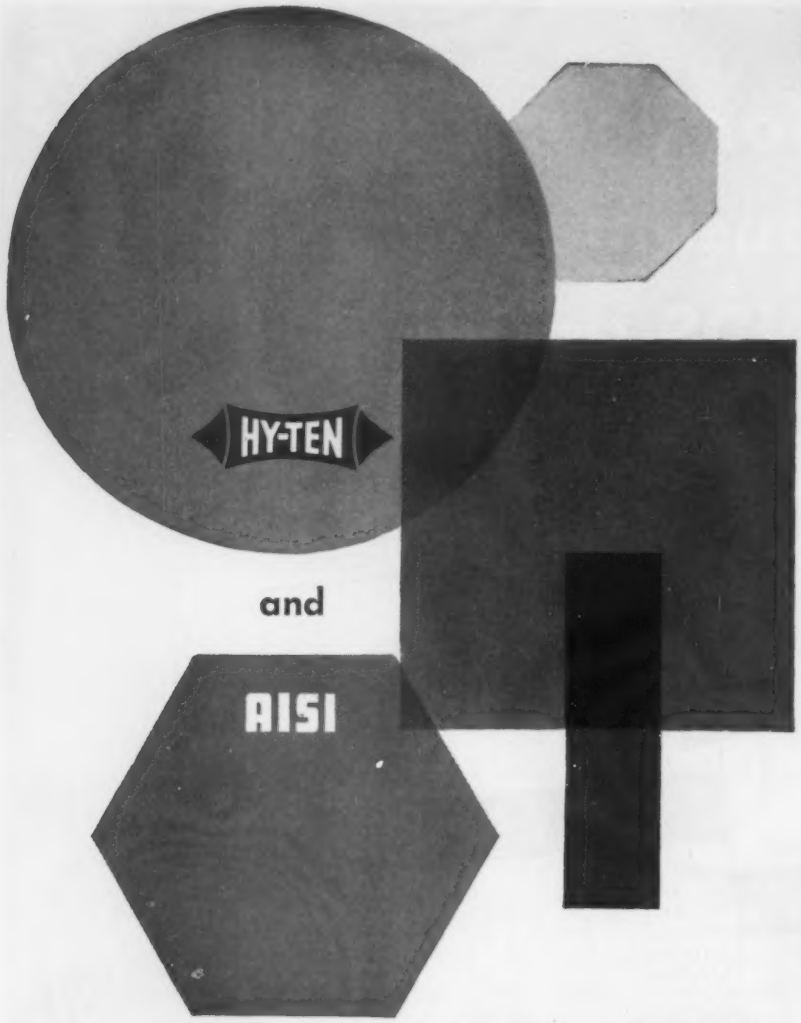

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work is done, not actually by you. He knows that a small pat on the back keeps up his good relations with you. Therefore, just do a little "pass-along" on your own.

Charles D Townsend
West Hartford, Conn

•

I THINK we should all try to recognize the good points in others and pass along little complimentary remarks. It gives importance to other workers and to the individual himself. If not overdone it is a good way to get cooperation and make people like you.

It does not matter who gets the credit so long as the business shows a profit. It is extremely important we understand that small words or acts of appreciation go a long way in influencing others.

Let's not kid ourselves—all grins are valued chiefly by the recognition they bring. We cannot go wrong in a little praise for a job well done so long as we do it around indiscriminately. However, it must be earned, or praise will do more harm than good. You do not have to go around the shop back-slapping everyone you meet. A knowing smile, or discussing the job in general with the employee is another method of recognition.

Even those who understand the art of good leadership slip once in a while. This is quite understandable when we deal with such a wide variety of personalities. We find some employees friendly, congenial, responsive. There are others who are belligerent, grouchy and insensitive. This means we have to know how to handle people as well as machines.

If the foreman wants to get out work and cut costs he has to recognize good work, extra service, extra effort, or outstanding merits. In the final analysis, don't be stingy with praise, but don't be extravagant with it either.

A E Salmons
Philadelphia, Pa

•

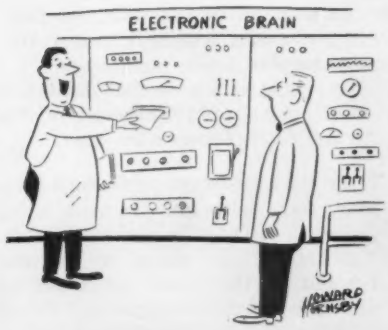
IF A WORKMAN DOES a good job on whatever is assigned to him, then he is entitled to and expects to receive credit for his workmanship and ability. Jones is no exception.

It is very rare indeed that one man should receive all the credit for a really good invention. Ed will not gain any good will from the men by trying to take all the credit for anything that is developed in the shop unless he made the original

sketches and the device was constructed without any change whatever.

The way these things generally work out is for the foreman to either show Jones about what he wants or to give him a very rough sketch of what to do. Then Jones comes in with a suggestion that by making a slight change here and there it will be possible to use some materials on hand, and partly machined. Then, maybe Smith, who happens to be around, suggests another change that will enable some hardened and ground bushings to be borrowed from a fixture that is no longer being used to save making more—and so on. This is cooperation of the finest kind; it gets results. But later, if Ed does not give Jones and Smith credit for their help, then Ed is just plain dumb and is stamping on his own toe instead of stepping forward in the firm's rating.

I know of the head of a design section with a dozen draftsmen who thought he was a very important person and he made it a must that every drawing had to bear his signature and his signature alone. No other person got any credit for anything and thus it looked as though the departmental head was the designer, draftsman and checker, if you went by the drawing title plate. The firm happened to have a general manager who was more interested in building up a solid foundation for the firm's output than he was in having a lot of conferences and he soon discovered what was going on. The general manager then sent a memo to the design head and told him to arrange for the transfer of all his men to other work. This brought the design head to the manager's office in a great hurry to protest the idea of losing all his draftsmen. The general manager said: "A careful check has failed to show that any of your men has ever done anything. We cannot allow a lot of draftsmen to sit around while you



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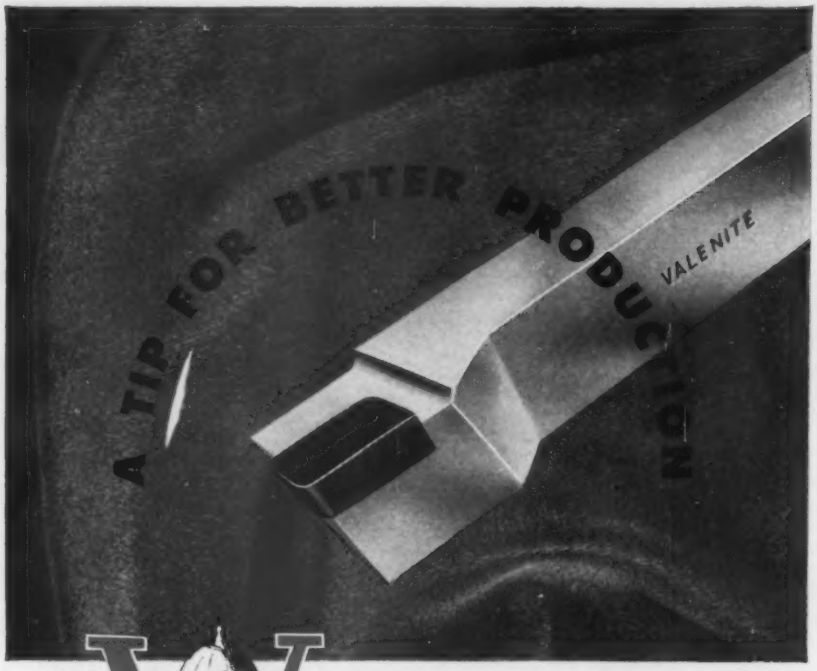

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VALENITE METALS CORPORATION
BOX 205, ROYAL OAK, MICH.

do all the work and that is what your drawings show according to the signing. If you are unable to assign work to your men, then they will have to be transferred." The departmental head then woke up very promptly and from that day every man who worked on a drawing signed it and received credit for what he had done; the turnover decreased and there was a noticeable improvement in design efficiency.

The foreman who takes a personal interest in his men and gives them credit for things that they do, straightens them up when they get a job tangled, uses stern discipline when needed and helps them all he can when they are sick, is a foreman who is going to succeed and if he knows his job thoroughly, he is in line for a promotion.

I know a foreman who promised the superintendent that a certain crane would be repaired and ready for service Wednesday morning. On Monday he was sent to a special convention and in the rush forgot all about the crane job. He was to return on Wednesday morning. Just at quitting time on Tuesday one of the repair men happened to notice the memo on the foreman's desk and told the gang—and what did the gang do? They put on their overalls again and worked up to 2 AM Wednesday getting that crane in working order. They worked overtime without orders, they did not know if they would be paid for it or not, since no work order had been issued. They did not care because they wanted to make good the foreman's promise. The crane was working when the foreman returned. The foreman saw to it that the men were paid, and he was more proud of his gang than ever. This man was an outstanding foreman and became superintendent a few years later.

Most men appreciate a foreman who is thoughtful of their welfare and who gives credit everywhere it is due even if he is a strict disciplinarian when they forget themselves and start horseplay.

Ed will not lose anything by passing out credit where it conceivably may be due.

George P Pearce
Albuquerque, NM

IT IS ONLY THE NARROW-MINDED foreman who will fail to pass along praise to the men in his department. The degree to which a foreman recognizes the value of deserved praise is often an important factor in promoting satisfaction. If, when we have done a good job, the man

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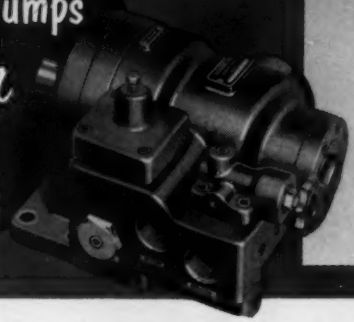

Automatically Provide

High Volume @ Low Pressure for fast closing, rapid advance, and rapid return.

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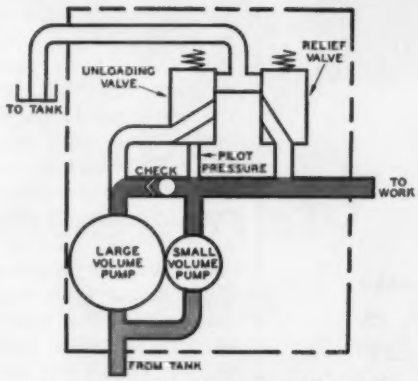

Fig. 1 Combined Delivery of Large and Small Volume Cartridges at Low Pressure

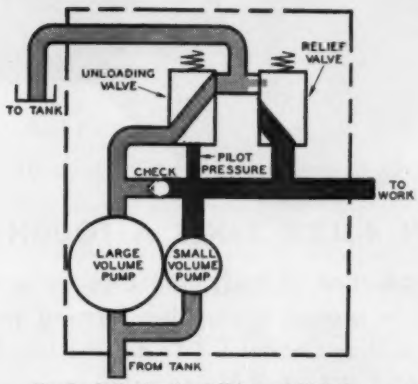

Fig. 2 Delivering Small Volume at High Pressure

Two Vickers Vane Type pumping cartridges are mounted on the same shaft—in the same housing, driven by the same prime mover. One provides a large volume of oil while the other delivers a small volume. These Vickers Two-Pressure Pumps have proved advantageous in a wide variety of applications.

For example, in closing a press or in rapid advance, both pump cartridges work together, supplying maximum volume for quick operation (see Fig. 1). When the press is closed and compression begins, or when the tool goes into feed immediately prior to beginning the cut, the large volume cartridge is automatically unloaded to the reservoir at zero pressure (see Fig. 2). The small volume cartridge alone then provides the lower volume required at high pressure.

These Vickers Two-Pressure Pumps are most economical in power consumption for such two-pressure operation. The reason for this is that a small-volume pump working at full capacity is MORE EFFICIENT than a large-volume pump working at partial capacity. Regardless of momentary delivery, the internal leakage of any pump is proportional to its size and operating pressure. The chart (Fig. 3) shows an interesting comparison between a Vickers Two-Pressure (Two-Volume) Pump and a variable volume vane type pump on a press circuit.

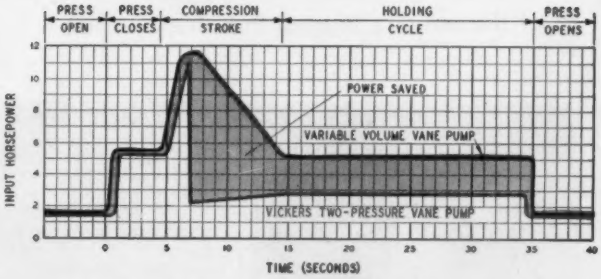

Fig. 3. On this typical press application the saving in power is approximately 50% with a resultant saving in heat in the system.

Like all Vickers Vane Pumps, these two-pressure pumps have the hydraulic balance feature that relieves bearings of all pressure loads (one of the major causes of wear). Cartridge construction enables customer to service in his own plant instead of returning to factory should repairs be necessary. Relief and unloading valves are integral . . . minimizing piping and connections. Complete range of sizes up to 48 gpm. For additional information, ask for Bulletin 54-70a.

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A Nilson 4-Slide, Number 1, forms 150 drapery hooks per minute from 0.70 basic steel wire. Nilson 4-Slides form wire or ribbon stock from the coil. They straighten, feed, pierce, blank, swage, stamp or coin, cut and form in one, fast, automatic operation . . . accommodate wire up to .5" dia., in feeds to 32" max., and ribbon up to 3.5" wide. Press sections from 5 to 75 tons.

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for whom we work tells us that it is a good job any of us will feel pleased. Of course this sort of thing can be overdone, but a tactful, observant foreman can do much along this line if he studies his men and finds out which of them responds to treatment of this kind.

A working force which is happy and content is a great asset to an organization. The passing along of a compliment on a job may seem like a little thing, but in the matter of satisfaction and interest little things sometimes count more than big things. Within the necessary limits of getting the job done, and with regard to all other conditions, the degree to which a foreman shows consideration in dealing with his men is an important cost element from the standpoint of the promotion of satisfaction and the development of leadership. This does not mean "babying the men," nor does it mean trying to "make popularity" by going easy, but, while of course, the work has to be done, there are many things that the foreman can do, if he wants to do them, in the way of showing consideration.

This of course does not mean playing favorites, for this is one of the surest way of promoting dissatisfaction. Those who are not favored soon notice that they are not and, as a result, their attitude becomes one of "what's the use."

The foreman who plays favorites knows in his own mind that he has no grounds for such action, and as a result of trying to bolster up his false position destroys more and more any attempts at cooperation from the rest of the force.

A word of praise, either originated by the foreman, or passed along by him, will go a long way in in-

"He's transferring you to the Elkins Plant? They tore that one down twenty years ago!"

CP cold riveting tools put the squeeze on assembly costs

This truck frame job is a good example of CP Hydraulic Tools teamed up to afford maximum efficiency and economy. Light and compact for easy handling by operators, the CP Hydraulic Punch at left exerts 25-tons of pressure to punch holes for running board brackets, while the compact 18-ton Hydraulic Riveter at right speedily drives the ⅜" cold rivets home! With CP Cold Riveting tools there's no heating or "bucking-up" needed. Large tonnage capacity and accurate pressure control afford simple one-man operation.

And more! Operators need no special training to handle CP Hydraulic Riveting equipment. Because of their noiseless operating qualities, operators and workers in the immediate vicinity work without distraction . . . get more done with less on-the-job fatigue. Write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

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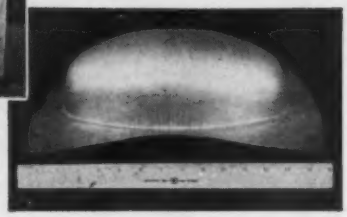
Cast spinning chuck for spinning aluminum.

.051" thick 51S type aluminum being formed on plastic die which was cast.



.051" thick stainless steel part drawn on plastic die.

Cast plastic hand-forming assembly block.

Plaster mold used for casting of plastic.

Tool being cast into plaster mold.

Material and fabrication time are the major considerations in tooling costs. Goodyear saves 50 to 75% with HYSOL 6000 Series tooling plastics! Here's how: . . . Per volume costs are cheaper than metal. Fabrication time and expense are also cut . . . tools are produced faster and with no increase in personnel or capital investment. A plastic die can be cast or laid up directly from master die models without hand barbering or fitting, requiring little skilled labor and no expensive machinery. Time is slashed, and a tool can be completed and in use within a few days. HYSOL produces more tools per dollar than any other method and eliminates large stocks of various sizes of steel and all metal waste.

Plastic tooling may solve your problems. HYSOL plastics are useful in a variety of molding, casting, laminating, and allied applications. Our research, design, and production departments are ready to serve you. Write, wire or phone.

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OLEAN, NEW YORK

creasing the interest the men have in the job. In general a man who is interested in his work wants to do a good job. He is "alive," and uses his head, while the disinterested man is "dead" on the job and only works from the shoulders down. An important element in the success of the plant is the degree to which all members of the force, including the foreman, are interested in their job. This matter of interest is well known to all good teachers and they use it continually in getting their students to do better work. It will work just as well in the plant on production jobs as on learning jobs, so it is well worth the consideration of the foreman.

The foreman's willingness to pass the praise along to the men shows the men that he wants to be square with them. A belief that a superior intends to be square will carry him over many a rough place, but good intentions alone will not do it. The value that subordinates set on square treatment was illustrated some time ago when about 1000 people who had graduated from high school several years before were asked to name the teacher who had left the strongest impression on them, and why. Almost all gave as the reason for naming a particular teacher the fact that he always tried to give them a square deal.

All foreman intend to be square, but in the hurry and drive of work, unless a man is careful to stop and think, he may forget to seem to be square. That is where he can create dissatisfaction that is difficult to erase. The foreman should take time to make sure he is treating the men squarely; he will then establish a reputation for being square that will carry him over in case he slips up sometime, as anybody is liable to do.

George H Koslow
Bronx, NY

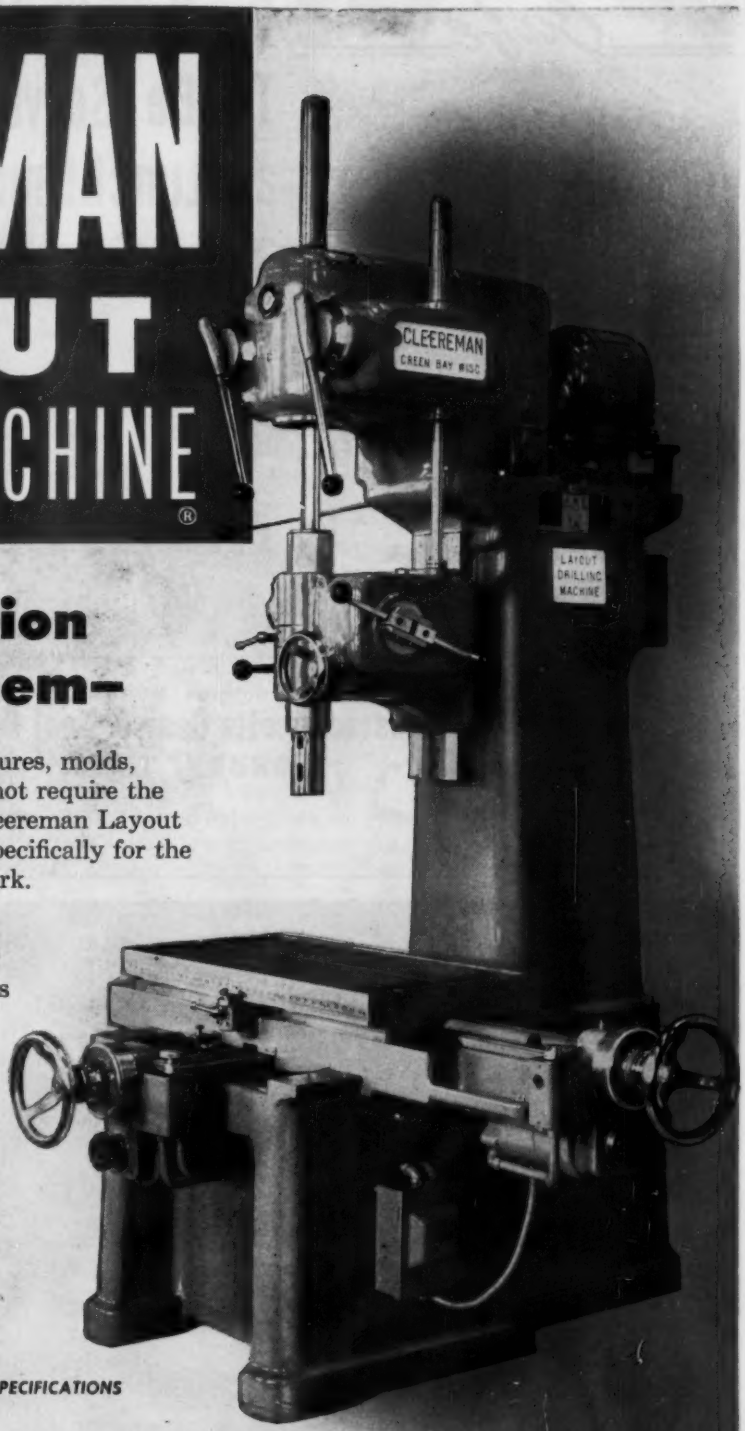
•

PROMISES, PROMISES

How flexible can an estimate be on the time involved for the completion of a job? Is the word of the man who will actually be doing the job accurate enough, or is it the responsibility of the foreman to set the time, subject to later amendment?

WHEN PROMISES ARE MADE they should be kept, otherwise the one getting the promise will lose all confidence in the one giving it. But this is not always as easy as it sounds, especially if pressure is applied to get short deliveries. Only a craftsman with many years of experience

CLEEREMAN LAYOUT DRILLING MACHINE®



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Built with many features of design similar to those used in Cleereman Jig Borers, the Layout Drilling Machine is an economical machine capable of accurately locating, drilling, boring, reaming, tapping, etc., with the utmost of operator ease, at a fast rate of production over a long period of time.

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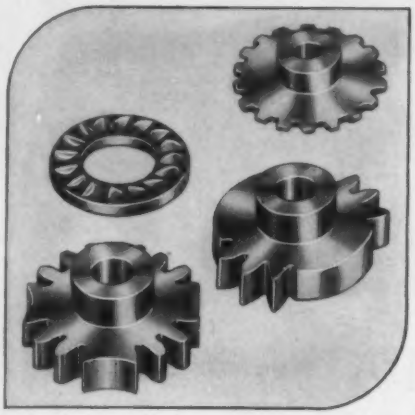
You can avoid these costly delays by specifying Mass Gears.

Prompt and attractive quotations can be obtained by sending your prints to Mass Gear.



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THE EASTERN MACHINE SCREW CORPORATION 20-40 Barclay St., New Haven, Conn.

is able to predict when a tool might be finished. He knows how many hours each operation takes, or he can guess pretty close to the correct time needed, but of course, time studies are more accurate, but too costly for toolwork.

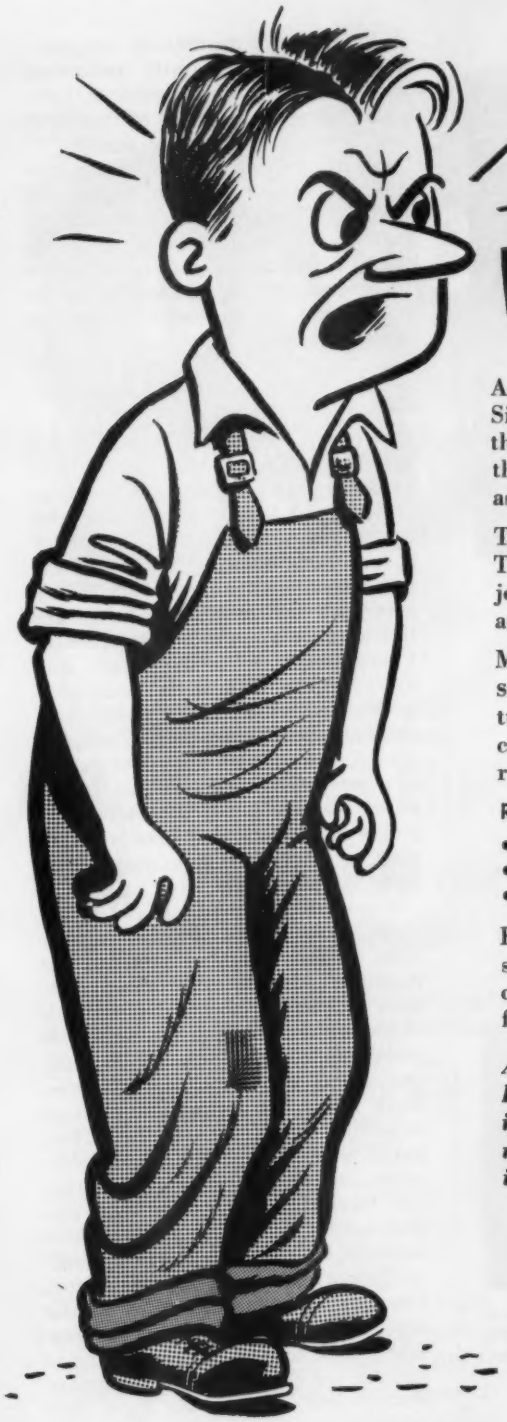
If Ed is to tell the Super when each job will be done he should try to analyze the making of every tool by splitting each task into its elementary parts and add the periods together. In doing so he should also consult the man he has ordered to make the tools. Or he may try to educate himself along MTM lines and use standard minutes to reach acceptable estimates.

Making notes on every promise seems to be a good scheme. Very few men will work effectively without some sort of supervision, and this should act like self-disciplinary supervision. Every man must then try, and will try, to keep his word. I don't think this is a ready-made loafing alibi for anybody. Ed's suspicion that his men will overestimate their time 50% to get a free afternoon proves that he himself is either incompetent to judge a correct estimate, or else his guys are unusually low in character. In either case some personnel changes should be made.

Al's suggestion that Ed and the man making a tool should together come to some sort of conclusion about how long the job should take is, under the circumstances, the only thing to do. If they cannot agree, a compromise might be reached. No toolmaker would go so far astray as to suggest a day for a job that takes only an hour to do. Ed is exaggerating and kidding.

Why not introduce some incentive system with standard time and a fixed bonus for each job if the time

"I'm getting pretty discouraged—tell me again what a good machinist you are!"



Who's got my Silicon 70?

Any man in the shop may have it, Charlie! Lots of 'em want Brightboy Silicon 70, and the other multi-use textures, too! Don't worry. If there aren't all the Brightboy wheel textures in your toolroom now that there should be, your dealer can get them to you pronto. Just ask for them, for only Brightboy can do many definite jobs.

There's a reason why Brightboy is so widely used and demanded. There's a standard "Stock" Brightboy Wheel "matched" for every job. No time-taking dressing or before-use preparation needed. No annoying delivery delay.

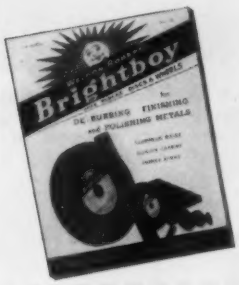
MORE: NOW you can obtain Brightboy in either ALUMINUM OXIDE or SILICON CARBIDE ABRASIVE GRAINS. Each of these absolutely uniform texture combinations comes in grain sizes ranging all the way from extra coarse to extra fine—"cushioned" all through in soft, firm or tough rubber binders.

Rubber and abrasive work simultaneously . . .

- *BURR, CLEAN, FINISH, POLISH, IN ONE OPERATION*
- *FREQUENTLY SAVE 50% IN FINISHING TIME*
- *PROVIDE THE FINISH THAT IS OFTEN THE FINAL POLISH*

Brightboy's action, application, versatility, will amaze you. You get a completely new concept of finishing, far beyond the range of other methods.

Ask your dealer for the new Brightboy Catalog. Advise us if he cannot supply you. Write us on any problem where finishing is involved.



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NEW BELT GRINDER with built-in "conveyor" grinds up to 14,000 SMALL PARTS AN HOUR!

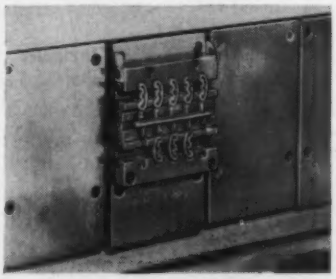
ENGELBERG

BG-8 AUTOMAT

for mass production of small parts

● The "conveyor" on this new Engelberg Porter-Cable wet-dry belt grinder is an automatic continuous work feed device with 21 fixture plates. These plates travel across the face of the 8" abrasive belt at speeds of 1090, 1350 or 1750 per hour. Depending on the number of pieces loaded on each plate, an operator can grind up to 14,000 or more small parts an hour.

Loading of each fixture is manual—ejection can be automatic. Work is advanced quickly to the belt surface, is fed slowly into the abrasive during its passage across the belt, is retracted quickly before leaving the belt. The finish is a straight-line finish with an accuracy of ±.0005" to ±.001".



● Close up of fixture plate capable of holding 10 small valves . . . one of the many ways large quantities of small parts can be mounted.

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185 Seneca St., Syracuse, N. Y.

Please send complete information on new BG-8 Automat Abrasive Belt Grinder and name of nearest distributor.

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is kept, and a decreasing remuneration for too liberally estimated time to even out mistakes? I have participated in a system of that kind and it worked out very nicely.

Ed must use a poor planning system when he runs up against so many difficulties. Why doesn't he call upon management to help him out? Harrison might have some ideas about planning systems, or he might call in somebody to set up such a system.

A E Fristedt
Stockholm-Bromma, Sweden

•

ED'S GROWL "I'd like to know how I can tell the Super when this job will be done when even the guy working on it doesn't know," would earn him the sack in some plants. It is part of a foreman's responsibility to know to a nearness how much work is in a given job and how many hours are likely to be required to execute it. That applies to bench work, and knowing the answer is knowledge which can only be acquired from long and varied experience, experience which one is entitled to expect in a competent shop foreman. If machine work is being considered, arriving at an estimated time is child's play to a really experienced, live-wire foreman.

On machining medium and heavy class work, metal removal usually calls for two roughing cuts and one finishing cut. The experienced foreman will know or will have means of finding out the appropriate speeds and feeds to apply to the job in hand. Out of his experience, he will also know how much setting and perhaps re-setting time to cover for. That, along with tool grinding and measuring, completes the debit. A standard feed and speed calculator will give actual cutting times for metal removal. A foreman worth his salt will know, to a close approximation, how much time to allow for setting and tooling. He will also know how much time to add for contingencies and for the slow but sure workman. Nonetheless, Al had the right idea when he suggests bringing the man into the matter of making a promise for completion. As Al remarks, that makes the operator think. Also, to some extent, it commits him.

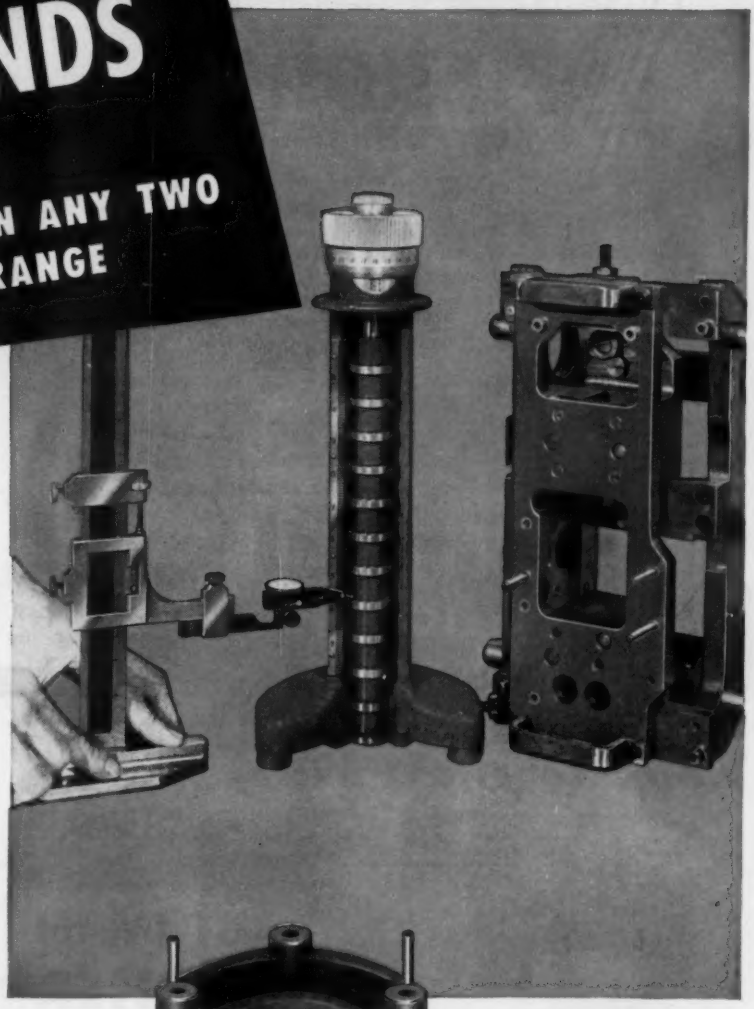
Ed's fear that asking an operator for an estimate of time for a job he may be doing or may be getting to do will result in an absurdly extended estimate may be justified in the event of an unreliable operator being consulted, but no alert foreman would depend on the help of an unreliable. In a shop engaged on maintenance work and variety production I personally estimate price

SETTING TIME:

10 SECONDS

ACCURACY:

.00005" BETWEEN ANY TWO POINTS IN 12" RANGE



Cadillac PLA-CHEK

SPEEDS ACCURATE INSPECTION from *MINUTES* to *SECONDS*

Designed for easy portability and extreme ruggedness, this 12" Cadillac PLA-CHEK takes little more than 10 seconds to set! Permits surface plate checking and inspections nearly 5 times faster than by ordinary methods.

And, accuracy is assured! Between any 2 points in the 12" range accuracy is guaranteed within .00005".

With a reverse checking plate, a height-gage indicator is easily set for checking the underside of parts. Use of inside micrometers, telescoping and internal cylinder gages gives this gage added versatility. Send coupon TODAY for complete details!

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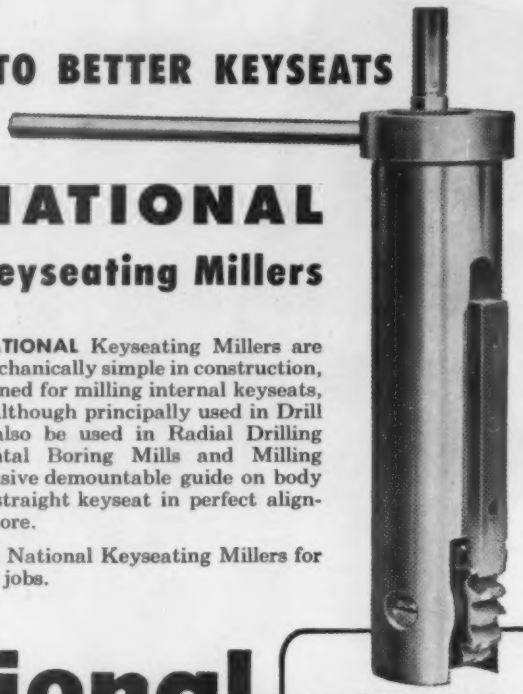

NATIONAL
Keyseating Millers

NATIONAL Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

You can depend on National Keyseating Millers for all your keyseating jobs.

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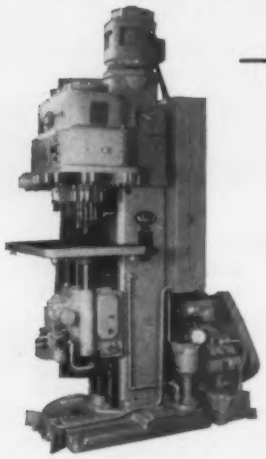

RUTHMAN
GUSHER
COOLANT PUMPS

Illustrated is a 2H6-904 National Automatic Tool equipped with a Gusher Coolant Pump.

Originators of the vertical ball-bearing machine tool motor driven coolant pump, Ruthman has maintained its reputation for excellence during the years by constant attention to quality, performance, and flexibility to customer requirements. In the future, as in the past, you can count on Ruthman to pioneer improvements and refinements that will make the Gusher an even better and more efficient pump for you.

THE RUTHMAN MACHINERY CO.
1818 Reading Road Cincinnati, Ohio

and delivery for almost every job. In the case of a machine operation, I run out a rough time-study for price and fix my delivery promise in line with the order book and existing promises. I know all the operators who can be depended on to give a reasonable time and occasionally, for the sake of a check, I hand the drawing concerned to one of the trusted.

Along with the drawing, I hand him a sealed envelope containing my calculated times, and when he has decided on his forecast he brings the lot to my office, produces a slip with his times and opens the sealed envelope to learn my estimate. In quite ninety per cent of such checks the difference in our forecasts is negligible. In the case of a fitting operation, I study the drawing carefully and, having been a fitter and marker-off in my day, I have a fair idea of what should be a reasonable time. When I have arrived at a conclusion, I hand my envelope and the drawing to a dependable fitter for a check estimate. I find this to be an excellent plan, and the men selected enter into the spirit of the game with evident enjoyment. Their participation is, of course, optional.

Their satisfaction is unconcealed when they catch the old man out and the old man doesn't mind being caught out now and then. It's good business that he should not always be right, in a sense. The scheme has many advantages, not the least being the satisfaction to the men of being consulted, and the fact that I can rush my effort through at top speed without having to spend valuable time on, say, careful checking. Knowing the men is, of course, the whole secret of success in operating the scheme. With gratifying results, I have worked this dodge for quite twenty years and, in the space of an article, can only give it in broad outline. I am quite prepared to be shot at for my claims here and if any of your readers—should this be

". . . Keeps my self-winding watch wound all day without moving my arm."

printed—wish to slate me, I will be glad to give complete and, I hope, convincing details for their information.

The good, solid, interested types who can be depended on to give reliable information, cooperate in a pally manner, obviously gratified that their views should be sought by the boss. The temperamental speed merchant, the prima donna type, glances somewhat contemptuously at the drawing and superciliously reels off the times he knows he would take, making it painfully clear to me, by implication, what a tenderfoot I am in such highly complex matters. I don't venture a sealed envelope with my calculated times to him, knowing full well he would probably treat them with lordly indifference and also knowing that the times I get from him he could undoubtedly achieve.

I don't ignore the third degree, the dull, the disinterested. The merely lazy among them I have found to exert themselves in spasmodic fashion if called on for a time forecast. I generally use the word forecast when I call on them; it appeals to their sporting instincts in much the same manner as do football pools. I don't depend on their help, I merely invite their opinion as a matter of policy. It is one way of learning if they are dumb as well as lazy. The efforts of the really dumb are pathetic, yet, they have their conceits too. They make a portentous and elaborate show of examining the task from every possible and impossible angle, usually arriving at the office about three days later with a breath-taking forecast that, if acted on, would put us out of business in no time. I never give them a sealed envelope; in most cases the shock of seeing my estimated time would probably be too much for them.

C D Mackinnon
Lanarkshire, Scotland

IT IS THE FOREMAN'S RESPONSIBILITY to estimate the time required to do the job, but in this case it seems to be beyond Ed's ability. What can he hope to accomplish by seeking help from the men? If he is a good foreman he can make a more accurate estimate of when a man will have a job finished than the man himself can.

I worked in a jobbing shop where an attempt was made to use this method of scheduling. At the beginning the men were all estimating far too low. They had confidence in their ability and plenty of enthusiasm for each new job assigned to them. As a result, they would over-

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• *At last*—a chain with welds as strong or stronger than the material . . . welds that won't break when links are bent sharply . . . welds made with two projecting lugs that absolutely prevent dangerous kinking of the chain . . . welds that provide 2¼ times the welded area found in normal flash or butt-welded links. **Accoloy X-Weld 125** Chains hang straight as a die. Every link is perfectly formed!

Accoloy X-Weld 125 Chain has almost countless uses: Slings, bundling, towing, general utility chains . . . It can be furnished in special analyses and heat treatments to provide greatly extended life and use on **tough jobs** . . . corrosive jobs . . . abrasive jobs . . . hot jobs. Specify **Accoloy X-Weld 125** for your next chain job for a new concept of chain performance, economy and value. Available in ¼", ⅜", ½", ⅝" and ¾" sizes.

• *Ask our nearest district office for further information on* ACCOLOY X-WELD 125 CHAIN, *or write the American Chain Division, York, Pa., for descriptive bulletin.*

PATENT APPLIED FOR

The Secret is in the Weld!

This Accoloy X-Weld 125 link was ground and etched to show its big welded area —2¼ times the size of welded area possible with other welding processes. This means more than double the security at the weld—and only X-Weld has it!

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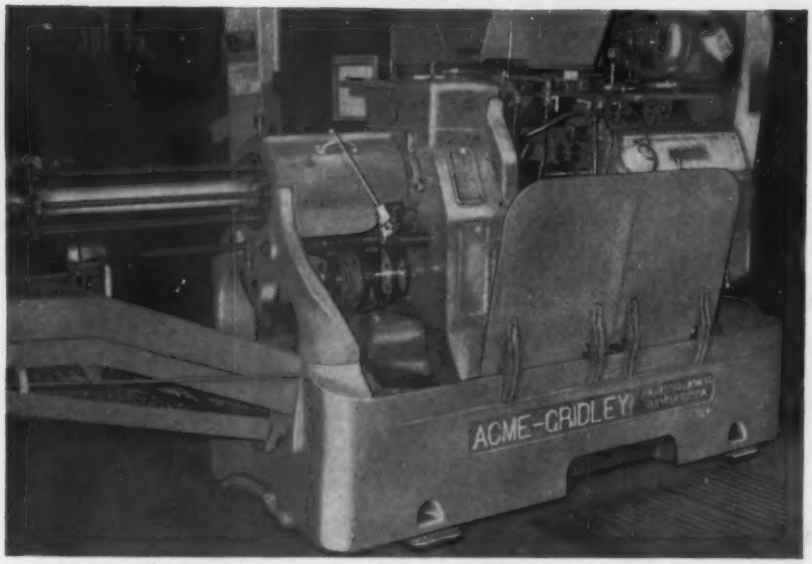

Acme-Gridley 1⅛" automatic screw machine in REPUBLIC AVIATION CORP. plant, Farmingdale, Long Island . . . showing UNISORB mounting pads under machine base. No costly floor drilling to install this machine.

AT AN AVERAGE COST OF LESS THAN $10.00 YOU CAN REDUCE VIBRATION, INSTALL MACHINES SECURELY ON

UNISORB®

MOUNTING PADS

Your first saving when using UNISORB is in the cost of the mounting pads, an average of less than $10.00 per machine. And savings in first cost are only the start. You also save 10% to 30% in time and labor for installation, because with UNISORB you do not have to drill floors . . . or patch floors when you move machines.

"FACTS ABOUT ANCHORING YOUR MACHINES ON UNISORB" gives you complete information about this modern machine installation method. Just return the coupon for your copy.

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200 SOUTH STREET, BOSTON 11, MASS.
"FELT FOR EVERY USE"
Offices: New York, Philadelphia, Chicago, Detroit, St. Louis
Sales Representatives: San Francisco
Mills: Johnson City, New York; Millbury, Mass.; Jackson, Mich.; New York City

FACTS ABOUT UNISORB INSTALLATIONS:

1. Transmitted machine vibration is reduced up to 85%.
2. Installation is safe, secure. Even cold headers are securely mounted on UNISORB.
3. Re-location of machines is greatly simplified.
4. UNISORB is available precoated with adhesive for use with machines which do not require shimming.

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Return to The Felters Co., 200 South St., Boston 11, Mass.

look certain operations when making the estimate and invariably failed to allow any time for errors and rework, for assembly and trial, and for necessary adjustments. The net result was that every job in the shop was behind schedule. After a while the men realized that giving a short-time estimate for a job did not necessarily mean that the foreman had a higher regard for their ability and speed. It only meant that he was annoyed at their inability to have the job ready on time. The men gradually increased the time on their estimates and it wasn't long before they were going over to the other extreme of making their estimates unduly high. They soon realized that this was a good arrangement. They pushed the job a little at the beginning, but then they eased off to make sure that they would not finish the job too soon. It was a snap to make an accurate estimate under this system; they always came out right. It was just like the man who ground down his plug gages to get the parts to pass inspection.

William Martin
Brooklyn, NY

New Books . . .

KEMPE'S ENGINEERS YEAR-BOOK 1955 (60TH EDITION) *Edited by C E Prockter. Published by Morgan Bros (Publishers) Ltd, 28 Essex St, Strand, London WC 2, England. Vol 1, 1345 pages; Vol 2, 1413 pages, 5x7. Price for cased set 77/6 ($12 approx)*

One of the most comprehensive reference books ever published, this standard British work deserves to be better known in the US. The fact that it has run through 59 editions is proof enough of its wide acceptance, and one is impelled to wonder why the complete revision, in both content and appearance, which took place in last year's edition was not delayed in favor of this year's, to make it a Golden Jubilee edition.

No ordinary review can possibly do justice to the scope of this work; suffice to say that it covers every known branch of engineering; mechanical, civil, aeronautical, automotive, electrical, hydraulic, gas, and atomic. There are even chapters on building, explosives, sanitary engineering, clays, safety, fuels, concrete, paints, patents, depreciation, and legal notes.

There are 79 chapters, with 1500 illustrations, and an index contain-

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"J&L 1200"
"J&L 1200" Steel provides the qualities that help machine operators do top-flight work at lower overall costs. With "J&L 1200," the operator obtains: better machine finishes . . . longer tool life . . . higher rates of speed. This fact has been proven time and again—in shop after shop.
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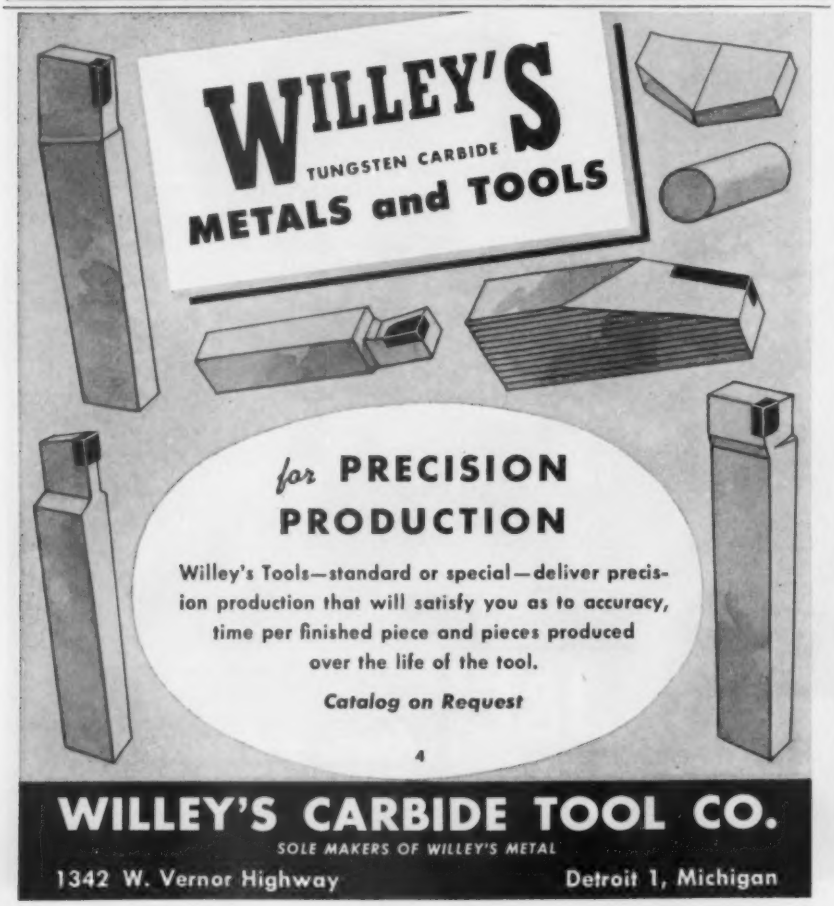
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ing over 17,000 references. In addition, a bibliography is provided for those chapters requiring it.

Each chapter has been prepared by one or more recognized authorities in the field covered, and the work of the editor was under the direction of B W Pendred, chief editor of *The Engineer*.

Because of the major changes in the previous edition, the changes in this year's are mainly matters of detail. Nevertheless, sufficient development has taken place in some fields to justify additional information being included to bring the content right up to date. The book rates a place on every engineer's book shelf to supply the answers to innumerable questions unobtainable in any other single publication.

•

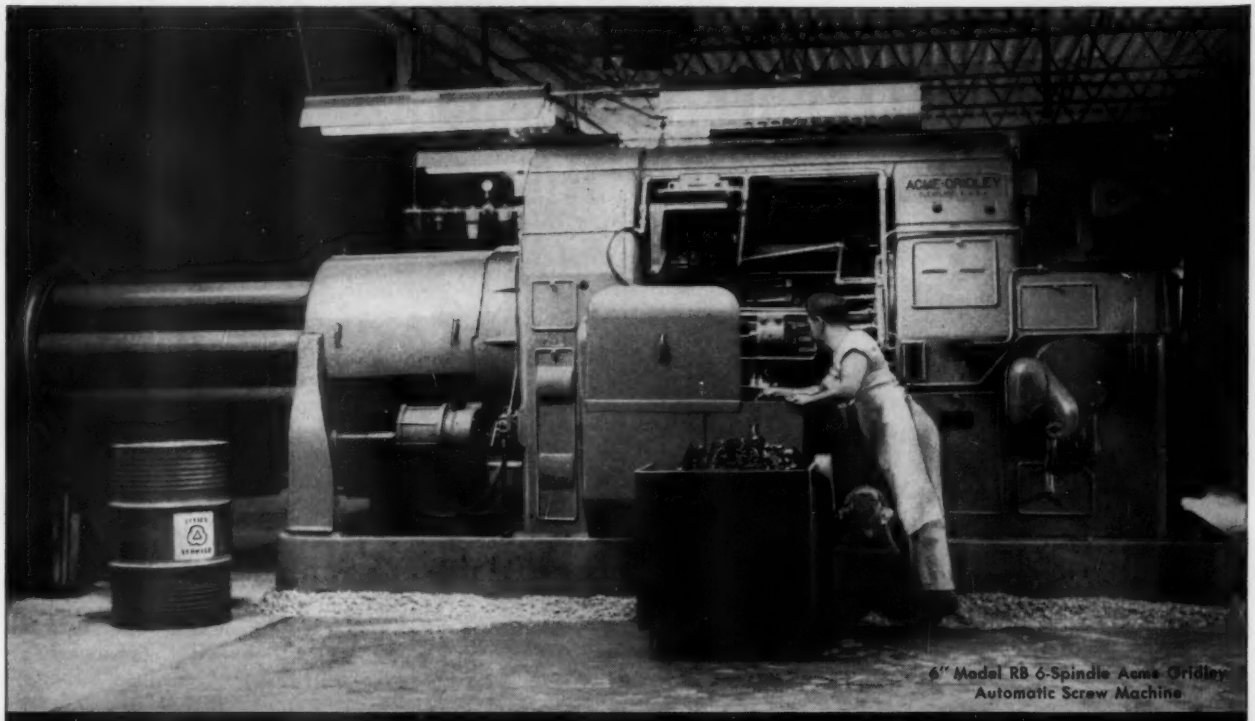
TESTING AND INSPECTION OF ENGINEERING MATERIALS—*By Harmer E Davis, George Earl Troxell, professor of civil engineering, and Clement T Wiskocil, late professor of Civil Engineering, all of University of California. Published by McGraw-Hill Book Co, 330 W 42nd Street, New York 36, NY. 430 pages. Price $6.50.*

This second edition includes new material on non-destructive testing, such as ultrasonic and penetrant, and on low-temperature impact tests. Also presented are new problems on columns, beams, springs, and strain gages.

The book covers general testing methods, measuring and testing equipment, methods of testing, principles, how to analyze the data, and details on how to go about testing in the laboratory. It is a suitable text for a concentrated course in testing and inspection, and also has value as a refresher or night-study text for shop people interested in test and inspection.

There is an adequate number of clear illustrations, including sketches, photos, and curves, and there is a section on specific properties of engineering materials. The text is what might be called economically written, with a minimum of grandiose phrasing and a resulting clearness and straightforwardness. Organization is quite rigid, and it is possible to pick out a given subject and read about it without wasting time in hunting around for what you want. For example, "elasticity" is indexed to page 26, and the first sentence on page 26 gives a definition of the word.

An unusually long reference sec-



6" Model RB 6-Spindle Acme Gridley Automatic Screw Machine

ONLY 5 MORE LIKE IT IN THE WORLD!

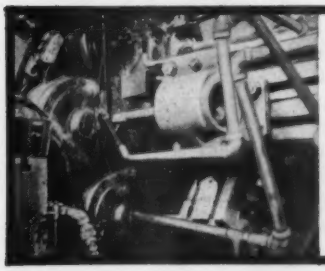
Owned by Jessen Manufacturing Company, today's most advanced automatic screw machine uses Cities Service Cutting and Hydraulic Oil

Weighing 39 tons and powered by a 60 H.P. motor, this 6-inch, 6-spindle Acme Gridley Automatic Screw Machine is one of the only six now in existence . . . and the only one owned by a job shop. Featuring a combination pneumatic-hydraulic operation, it can turn out a single load of stock weighing 3 tons!

The owner is Jessen Manufacturing Company of Elkhart, Indiana—since 1923 famous for keeping on top of new developments. It's not strange, therefore, that for this advanced new machine they chose a top quality coolant—a Cities Service cutting fluid.

Says President J. H. Jessen: "We're happy to say that the Cities Service cutting oil we use today is one of the finest all-around cutting oils we have ever used. In years past, we felt that if a cutting oil was good, it had to be black, heavy, and odorous. Cities Service has changed our minds with a cutting oil that has outstanding cooling abilities, good chip drain-off, is anti-weld . . . and yet possesses light, clear color and has no noticeable odor. In addition, Cities Service Pacemaker Oil used in hydraulic systems, and Amplex Lubricating Oil are doing an outstanding job throughout our shop. We proudly recommend *all* these Cities Service Oils."

For more information on the complete line of Cities Service cutting fluids, call in a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



Light, Clear Coolant in Acme-Gridley Automatic is Cities Service cutting oil. "Outstanding cooling, anti-weld, and chip drain-off ability," says Jessen. Firm also praises Pacemaker Oils, used in their hydraulic operations.

Jessen Mfg. Company, Inc. Mr. Jacob Jessen, Pres., in business since 1923, has earned reputation of keeping on top of new developments. In 1935, he was one of the first to install 6-spindle, anti-friction bearing screw machine.

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PEARLITIC MALLEABLE CASTINGS

If service conditions are unusually rugged and you're troubled by high manufacturing costs—look to pearlitic malleable castings!

Pearlitic malleable has high fluidity that casts easily into complicated shapes. It resists wear under heavy loads at high speeds . . . has high ultimate strength . . . possesses excellent non-seizing properties for bearing surfaces . . . can be given a very smooth finish where desired . . . and can be either liquid quenched or air quenched. And perhaps *most important of all, pearlitic malleable machinability index ranges from 80 to 90* (B1112 steel = 100).

So look your product over critically. Then check pearlitic malleable castings. They can replace more expensive methods of fabrication or manufacture . . . can lead to reduced weight, less machining time . . . fewer assembly operations . . . *greater sales appeal for your product.* AA-106

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tion is classified for those who want more information on a specific subject, which can be easily found.

•

NON-FERROUS FOUNDRY METALLURGY—*Edited by A J Murphy, professor of industrial metallurgy, University of Birmingham, England. Published by McGraw-Hill Book Co, 330 West 42nd St, New York 36, N Y. 497 pages. Price, $12.50.*

This book written in England is based upon the concept that metallurgical processes must depend upon application of scientific principles (that is, adequate control) rather than operative skills. New material includes the part played by gas dissolved in molten metals, factors influencing grain size of castings, and mechanical properties of components, or complete castings, instead of conventional test samples. The book is intended for use by practicing metallurgists in the non-ferrous foundry field, as well as students.

•

STRENGTH AND RESISTANCE OF METALS—*By John M Lessells, president, Lessells & Associates, Boston. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, NY. Price $10.*

Exact solutions for problems in machine design are currently practical if the engineer has reliable information on how materials behave under applied stress. The combination of advanced theory and suitable experimental data lead to more economical designs.

Many people in recent years have worked upon the behavior of metals under stress. The author, while associate professor of mechanical engineering, MIT, worked on fatigue, and has written extensively on the subject. In fact, this book is an enlargement of Part II of *Applied Elasticity* by S Timoskenko and the author, a work published by the Westinghouse Technical Night School Press in 1925, plus other sources.

The first chapter discusses the tensile test, and some guidance is offered in respect to applications where this test is used for acceptance purposes. New concepts in true stress-strain characteristics are mentioned.

The second chapter discusses the mechanism of overstrain and the modifications produced in tensile-test properties by cold drawing. Residual

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with NO HEAT TREAT DISTORTION

by specifying

STRESSPROOF®

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The new giant DoALL Contourmatic band saw — the world's largest — is a key part of the Air Force's "Heavy Press Program." STRESSPROOF is used on important operating parts.

on key operating parts

The lead and feed screws on the new DoALL Contourmatic must be strong since they transmit power. These important lead and feed screws must also be straight and free from growth and shrinkage, since upon their accuracy depends the accuracy of the huge extrusion dies machined on the saw. STRESSPROOF gives them this strength and accuracy.

STRESSPROOF was specified because it eliminates heat treating and its attendant distortion and warpage problems. In addition, STRESSPROOF wears well, has the necessary strength and is easily machined.

STRESSPROOF makes a better part at lower cost.

Write for helpful data bulletin No. 15 . . . "Improve Quality — Cut Costs"

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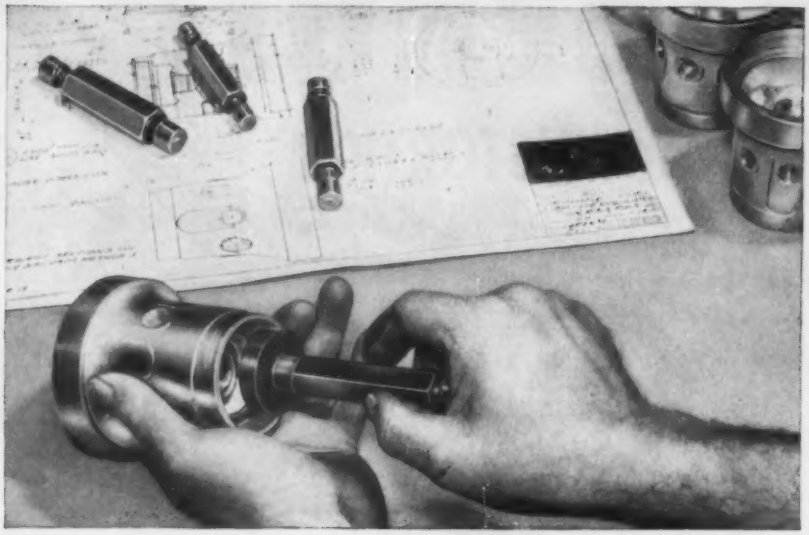
MANUFACTURERS OF AMERICA'S MOST COMPLETE LINE OF QUALITY COLD-FINISHED STEEL BARS

Linde FLAME-PLATING NEWS

Trade-Mark

News of another successful use of LINDE's process for applying a tungsten carbide coating to metal parts.



Flame-Plated plug, ring, and air gages have extra-high wear resistance for long-lasting accuracy.

Flame-Plated Plug Gages Outwear Carbide Gages 3-1... Hard Chrome Plated Gages 20-1!

Flame-Plating, a LINDE Service for depositing a thin coating of hard, wear-resistant tungsten carbide on metal parts and many tools, continues to be used with highly successful results on plug, ring, and air gages. The wear-resistant tungsten carbide coating, applied in LINDE's Flame-Plating plant, gives gages lasting accuracy through a longer wear life. Flame-Plated plug gages, for example, have actually outworn solid sintered tungsten carbide gages 3 to 1...hard chrome plated gages 20 to 1.

TEMPERATURE COMPENSATION PROBLEMS REDUCED

Flame-Plated gages have the same coefficient of thermal expansion as the gage base metal. When the gage base metal is similar or identical to the part being gaged, temperature compensation problems are either greatly reduced or eliminated entirely.

CHIPPING AND BREAKAGE PRACTICALLY ELIMINATED

Flame-Plating a gage with tungsten carbide produces a hard, wear-resistant surface while retaining the toughness of the base metal. Thus, the problem of breakage is greatly minimized especially on small diameter gages. The tungsten carbide coating is also highly resistant to chipping. These factors are important advantages over solid sintered carbide gages.

AVAILABLE NOW AT LEADING GAGE SUPPLIERS

Flame-Plated plug, ring, and air gages are now available in standard AGD sizes. Plug gages from .059-in. up. Ring gages from .375-in. up. Ask your gage supplier how you can cut inspection costs with Flame-Plated gages or call the LINDE office nearest you. Send for your free copy of the Flame-Plating booklet today.

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stresses are briefly reviewed in relation to overstrain.

Short-time, rupture, and creep tests of carbon and alloy steels, also gas-turbine super alloys, and a review of how test data may be used in design, are covered in chapter 3.

Underlying reasons for adoption of the notched-bar impact test and the fracture test, are discussed in Chapter 5, as a means of material control.

Fatigue, one of the author's special fields, is covered in several chapters on varies aspects of the subject.

Altogether, Mr. Lessells has produced a scholarly, sound and valuable book for the design engineer and advanced students.

Names in the News...

Chrysler Corp promotes: **Charles B Gorey, Jr,** a member of the staff of the vice president and operating manager, to director of forward planning for central manufacturing; and **David L Sutter,** technical specialist in the office of the staff master mechanic, to director of forward planning of the Defense Operations Division.

Dwight H Renfrew, general superintendent of Link-Belt Co's Philadelphia plant, has been appointed chief engineer. **William A Morley,** superintendent of the Olney foundry, succeeds Mr Renfrew.

Douglas A Hopper, manager of General Electric Co's warehousing and field services, Large Lamp Department, Nela Park, Cleveland, has been named general manager of the Welding Department, York, Pa. He succeeds **Raymond C Freeman,** appointed manager, engineering and operations, Atomic Power Equipment Department, Schenectady, NY.

DeWitt L Shelly has been named manager of the Special Products Group recently formed to expand manufacturing and marketing activities of Westinghouse Air Brake Co's Air Brake Division, Wilmerding, Pa.

M Nielsen, vice president of Babcock & Wilcox Co's Boiler Division, has been elected to the newly created post of executive vice president of the company. **L S Wilcoxson,** vice president in charge of research, has been appointed Mr Nielsen's successor.

Quality Speaks

among the thousands of users of

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders

THE THOMPSON GRINDER COMPANY, SPRINGFIELD, OHIO

which means:

"minimum-wage" labor can consistently produce precise borings with
UNIMATIC PRECISION-BORING MACHINES

Write today for your free copy of PUSH-BUTTON PRECISION *and learn how you can get automatic precision boring at lowest cost.*

A user says "The simplification of operation makes it a very excellent machine tool, and one that does not require a highly skilled machinist to obtain the desired speed and accuracy. As a result . . . machine time costs have been cut very drastically."

Dealer and agent inquiries invited.

ATLANTIC INSTRUMENT CORPORATION

90 BROADWAY NORWOOD, MASSACHUSETTS

Walter H Schefft, plant controller of Eaton Manufacturing Co's Stamping Division, has been appointed to the newly created post of assistant to the division manager. **Robert F Buettner,** assistant controller, has been named to succeed Mr Schefft.

Republic Steel Corp appointments: **Samuel C McDowell,** assistant chief industrial engineer, to manager of the Pressed Steel Division; **Theodore G Humphrey** to container sales manager; **Frank F Malcher,** Cleveland plant sales manager, to pressed steel sales manager; **Harold C Seifert,** assistant works manager of the Bolt & Nut Division, to manager, succeeding **John Dunlop,** transferred to the industrial engineering department in the company's general office; **Charles A Paler,** superintendent of the Gadsden, Ala, plant, to succeed Mr Seifert; **J C Noble,** production manager at Gadsden, to take over Mr Paler's post.

Trane Co of La Crosse, Wis, names three executive vice presidents: **R James Trane,** president of the company's subsidiary, Trane Co of Canada, Ltd, Toronto; **Wayne J Hood,** vice president and treasurer; and **Thomas J Hancock,** vice president, sales. **Richard H Pearse, Sr,** purchasing agent, has been elected vice president.

Clare F Saltz has been appointed manager of the ordnance equipment division of the US Hoffman Machinery Corp, New York.

Folke W Anderson, superintendent of National Can Corp's Kedzie plant in Chicago, has been appointed assistant plant manager.

George E Little, formerly plant manager for Fabricated Steel Products, Wascom, Texas, has been appointed manager of the machine products sales division of J B Beaird Co, Shreveport, La.

Roy M Nelson has been appointed Detroit sales representative for the Miles Machinery Co, Saginaw, Mich. He will make his headquarters in Birmingham, Mich.

Bruce A Willsey, manager of the manufacturing division of Solar Aircraft Co's San Diego plant, has been named assistant manager of the company's Des Moines, Iowa, plant.

Clyde W Seymour, Jr, assistant manager of manufacturing at San Diego, succeeds Mr Willsey. **Marvin L Nelson,** quality control division manager at Des Moines, takes over Mr Seymour's post.

ANTISEP the all-purpose water-soluble cutting base

Making machine tools pay off faster is a job for **ANTISEP**

Machinists continue to marvel at the results they get with Antisep All-Purpose Base, and so will you.

Antisep is economical to use, because water is the diluent—25 to 1 for most jobs. That's low price per gallon in the machine.

Combine this economy with the greatly increased production obtained with Antisep Base, and the result is cost saving that makes machine tools *pay off faster!*

You'll find that Antisep's performance stands out over ordinary cutting fluids. This base is fortified to provide high film strength and anti-welding properties formerly obtainable only with straight oils.

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A MESSAGE TO AMERICAN INDUSTRY • FIFTH OF A SPECIAL SERIES

FINANCIAL AID TO HIGHER EDUCATION

Business Help for Our Colleges A Job for All Business Firms

IN recent months, individual business firms have announced the adoption of a variety of plans, both imposing and ingenious, for financial aid to higher education in the United States. In doing so, they have taken a lead in dealing with a problem of transcendent importance both to the business community and to our nation as a whole.

Previous editorials in this special series have shown that:

1. Our colleges and universities, and particularly the independent, privately endowed institutions, are in grave financial difficulties.
2. These difficulties promise to become much more acute in the years immediately ahead unless extraordinary steps are taken to relieve them.
3. A financially crippled system of higher education is a major national menace.

If, however, the business community is to play an adequate part in helping our colleges and universities financially, the plans adopted by business firms thus far constitute merely a beginning and a set of guide posts. What is required is a general movement on the part of business firms to go to the financial aid of higher education. Such a movement would involve a myriad of individual company plans which, in the nature of the case, cannot be expected to bring great renown or publicity to their sponsors.

Rescue Operation Is Feasible

For the business community as a whole it is feasible to make a major and possibly a decisive contribution to putting our colleges and universities back on their feet financially. One percent of business profits before taxes would do it. In 1954 business profits before taxes were about $35 billion. If one percent of these profits, or $350 million, were contributed to our independent, privately endowed colleges and universities it would enable these institutions (1) to increase the salaries they pay by $200 million a year, and (2) to provide $150 million more for modernization and maintenance of their establishments. In the opinion of competent authorities, this would put these institutions in relatively good working order financially, a process to which a matching grant of $50 million by the Ford Foundation for the improvement of faculty salaries will make a large contribution. It would add about one-fourth to their present annual outlay of about $1.4 billion.

Such a contribution from business would not meet the needs of the independent institutions for new buildings and equipment required to accommodate the great increase in college enrollment anticipated in the years immediately ahead. Neither would it relieve the financial problems of our tax-supported colleges and universities. As a group these institutions have fared better financially in recent years than the

independent institutions. But they also face grave financial problems, particularly in the provision of adequate faculty salaries. It would be far simpler, however, to solve the financial problems of the tax-supported institutions if the independent colleges and universities were back on their feet financially.

One Dollar Does Work of Two

The federal government exempts 5 percent of business profits from the tax imposed upon them if the 5 percent is devoted to religious, charitable or educational purposes. (Most profits are taxed 52 percent.) A contribution of one percent of business profits to higher educational institutions would exhaust only one-fifth of this allowance. It would bring to about two percent the total share of business profits going to both educational and charitable purposes.

In 1953, business firms contributed about $400 million, or slightly more than one percent of profits before taxes to educational and charitable purposes of all kinds. Of this total about $75 million went to educational institutions, mostly colleges and universities.

For some companies it is feasible to contribute more than the average contributed by business generally. Indeed, some companies not only utilize their full 5 percent of tax-deductible funds for charitable and educational purposes but go beyond it. For other companies in financial difficulties no contribution at all is possible.

If, however, those business firms for which it is financially feasible contributed one percent of their profits before taxes to our colleges and universities, the problem of adequate support for the crucially important business of higher education would be far along the way to successful solution. **In 1954 a contribution of one percent of their profits before taxes, or about $350 million, would have reduced business profits after taxes by only about half that amount. This would have meant a reduction of about $175 million, out of a total of about $17.8 billion of profits after taxes.**

Attractive plans to channel financial aid from business to higher education have been abundantly demonstrated recently. These plans, for the most part the creation of large corporations, have included not only a broad array of scholarship grants, but such ingenious arrangements as that by which a company matches with its funds the gifts its employees make to the colleges of which they are alumni.

A full array of these plans, some of which were discussed in an earlier editorial in this series, has been prepared by The Council for Financial Aid to Education (6 East 45th Street, New York City 17) and is available for the asking. Also, colleges and universities have established in most states and regions cooperative associations to help business help them. The Commision on Colleges and Industry (912 Kahn Building, Indianapolis 4, Indiana) distributes a directory of these associations. And, of course, the colleges themselves are always eager to discuss their financial problems with business people and suggest constructive solutions.

Only Small Start Made

The plans for business aid to education which have recently attracted national attention constitute the conspicuous sort of leadership which it is the privilege and opportunity of our great corporations to provide. But the job is too large to be handled by a small number of business firms, no matter how bold or ingenious their programs.

To put our colleges and universities back on a firm footing financially the help of the great rank and file of business corporations is required. All of them, large and small, have a crucial stake in seeing that this job is done. The future of America will be decisively shaped by what happens in and to our college classrooms.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

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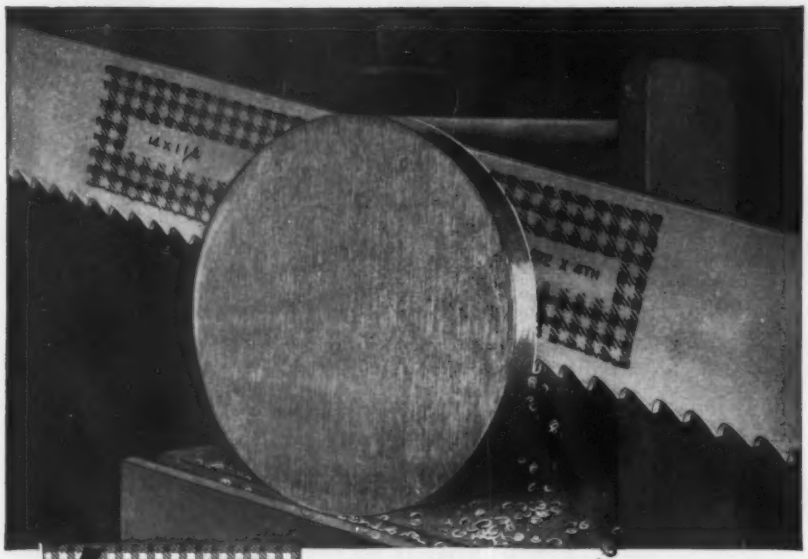
When the chips are down



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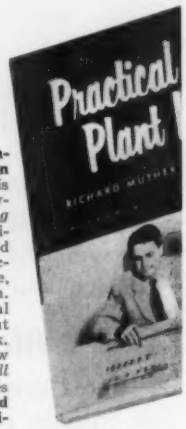

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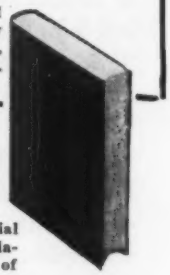

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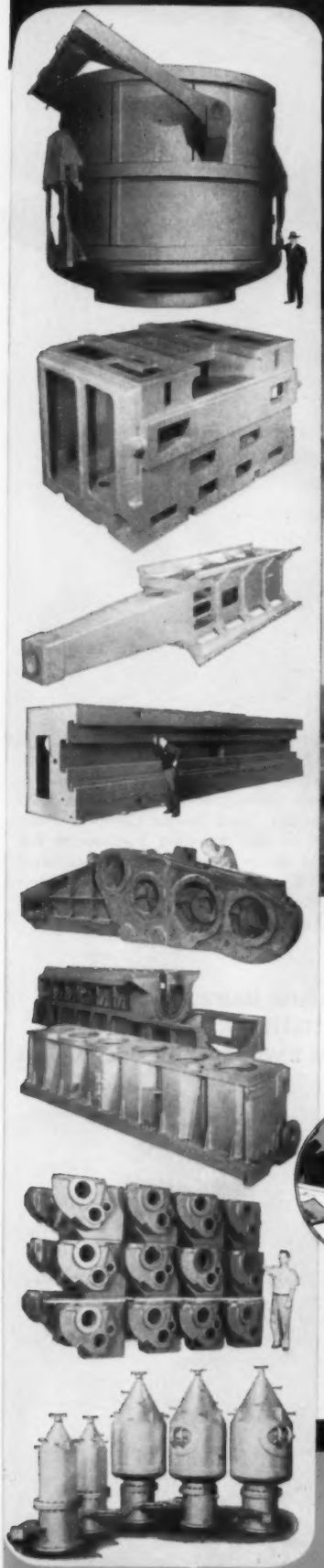

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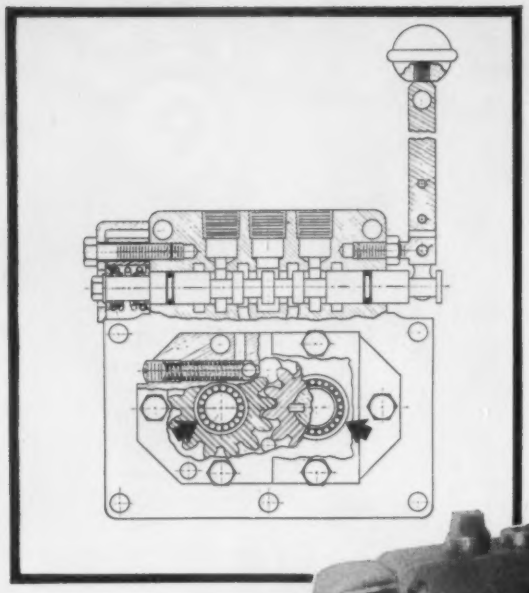

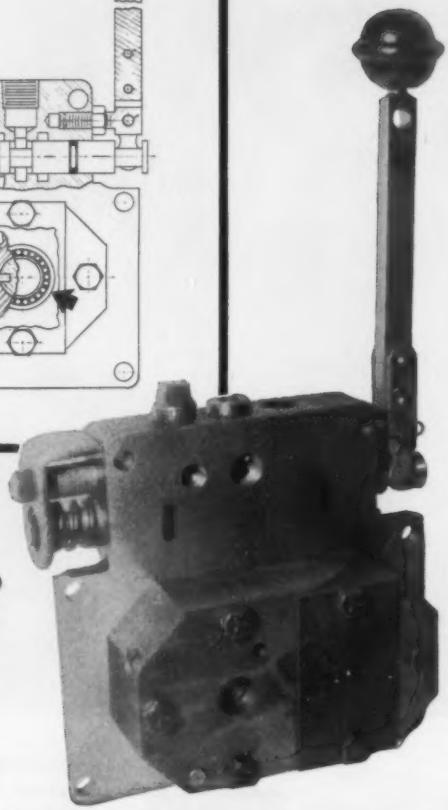

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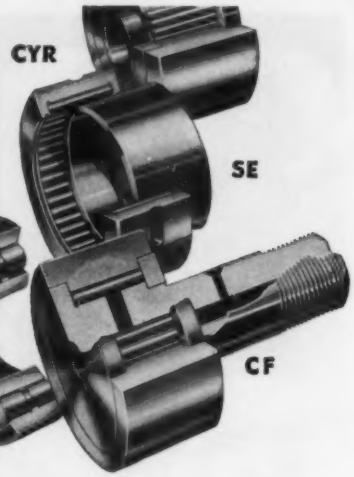

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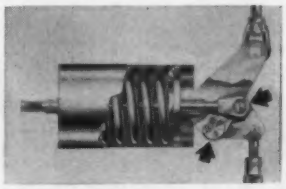

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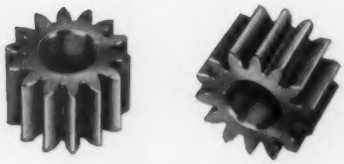

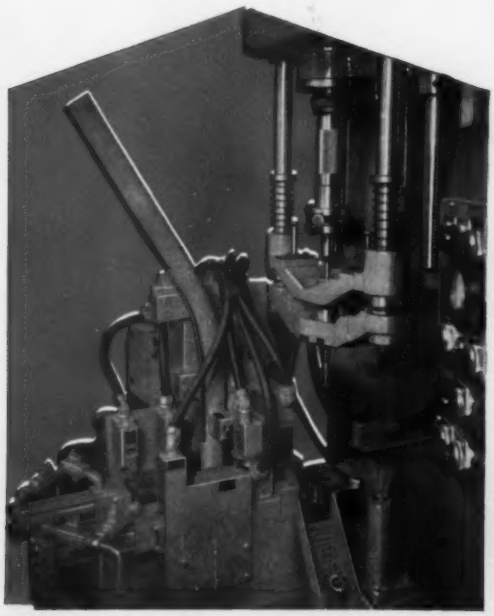

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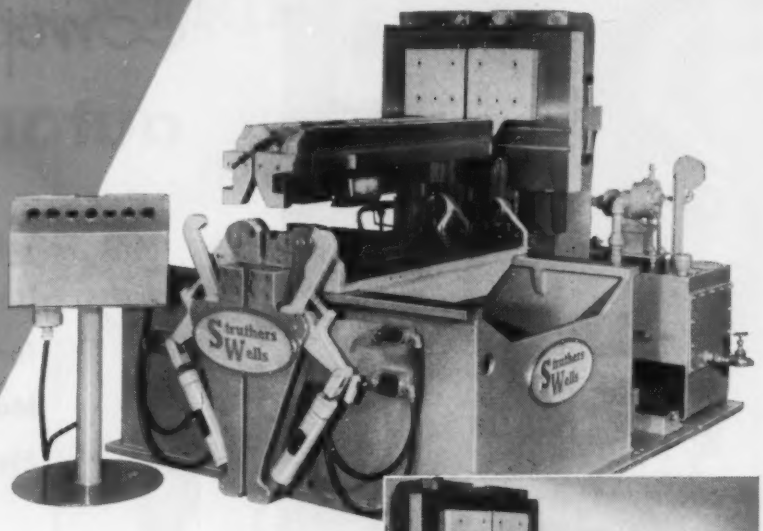

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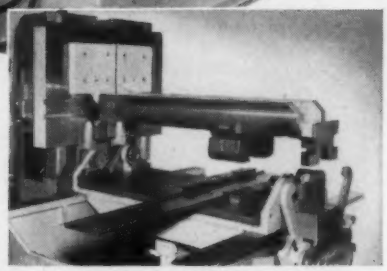
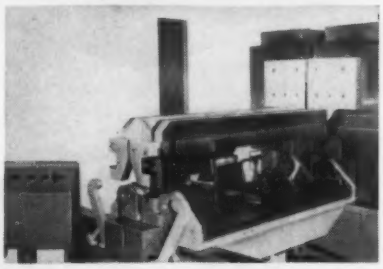
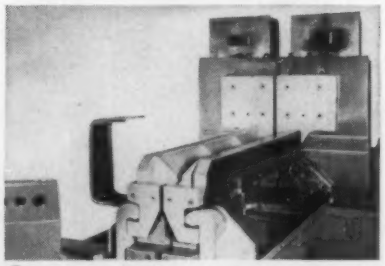


Flanged and punched sheet positioned for bending



Two bends made in first operation



Material positioned for second operation

Second operation completes bending of parts

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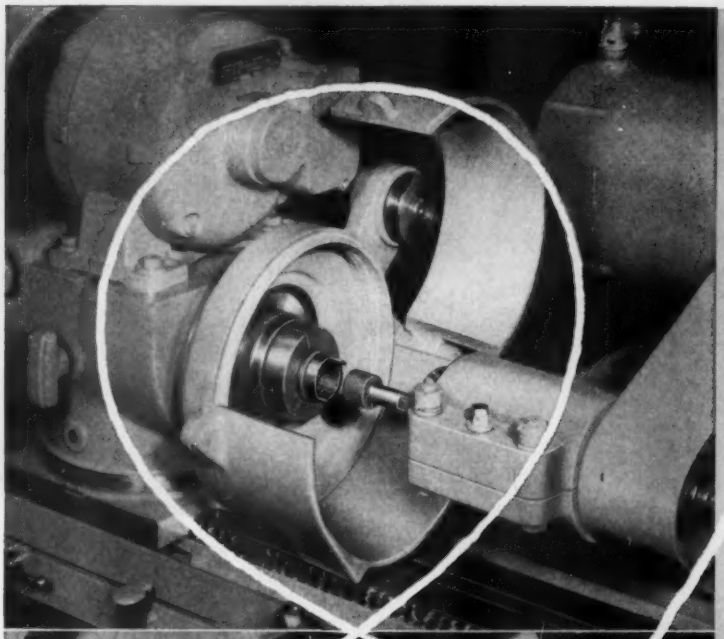

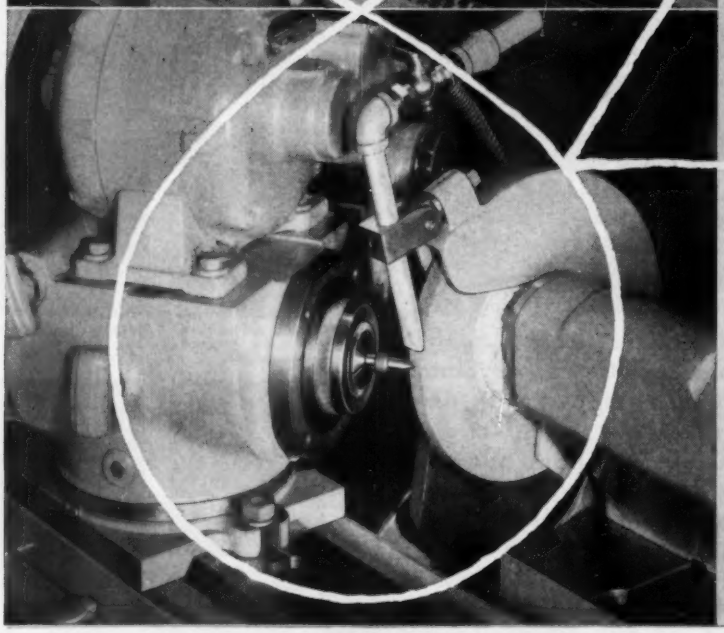

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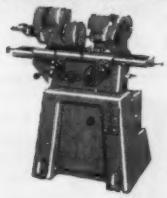

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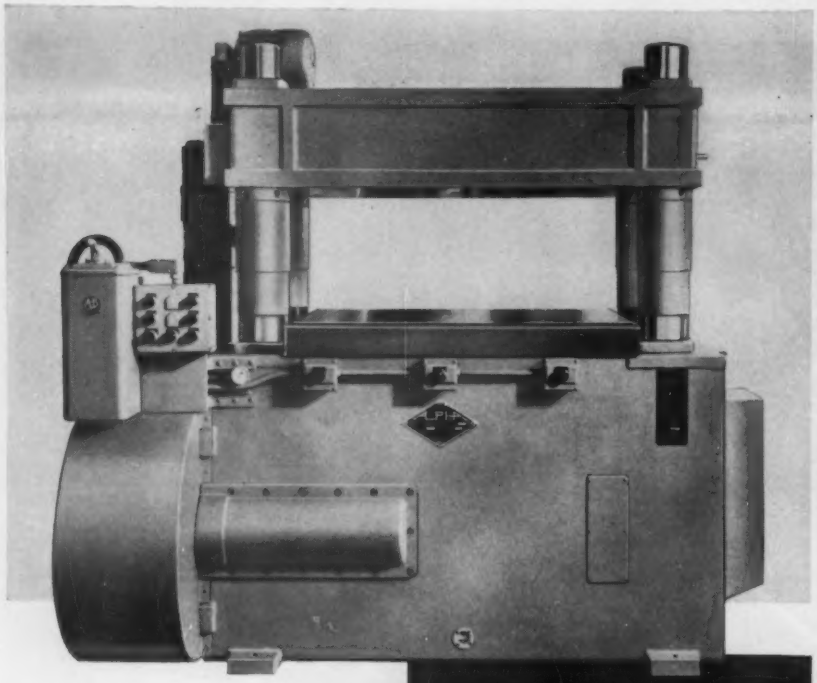

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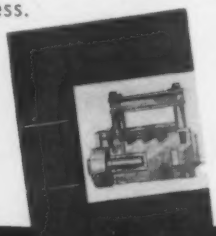

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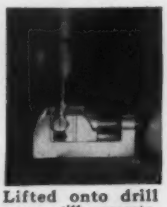

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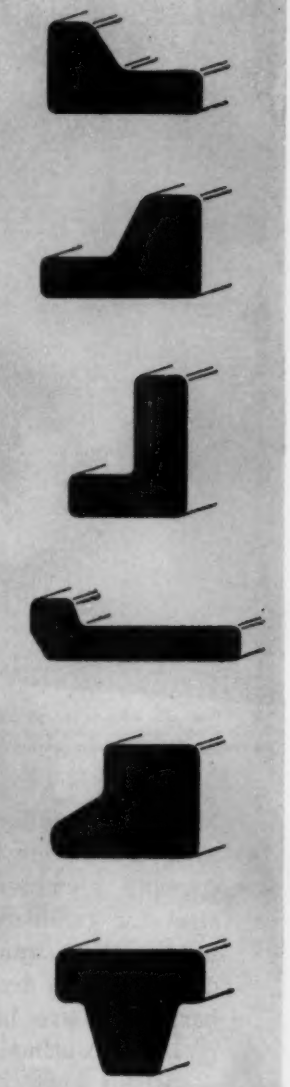

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Mr. Thos. E. Adams, Jr., President, says, "We've used our H-P-M successfully for drawing aluminum, steel and stainless steel for commercial and military contracts. Work ranges from shallow pan draws to deep drawn stainless steel beer barrels. We're highly pleased with its record of continuous operation since 1945 —without downtime or failures."

Production records like this at the Beatrice Steel Tank Mfg. Co. of Beatrice, Nebraska tell the story. For downright dependability, a minimum of maintenance, maximum production and all-round satisfaction — you can't beat an H-P-M.

It's a typical example of how H-P-M's all hydraulic operation, fast cycle, automatic control and easy die set-up cuts costs for many prominent users. You'll find more and more jobs belong on an H-P-M — that one H-P-M press can often replace older, obsolete equipment with important improvements in quality, production and maintenance. See your H-P-M field engineer at the first opportunity . . . find out how an H-P-M can start making money for you, too.

HPM

THE HYDRAULIC PRESS MFG. COMPANY

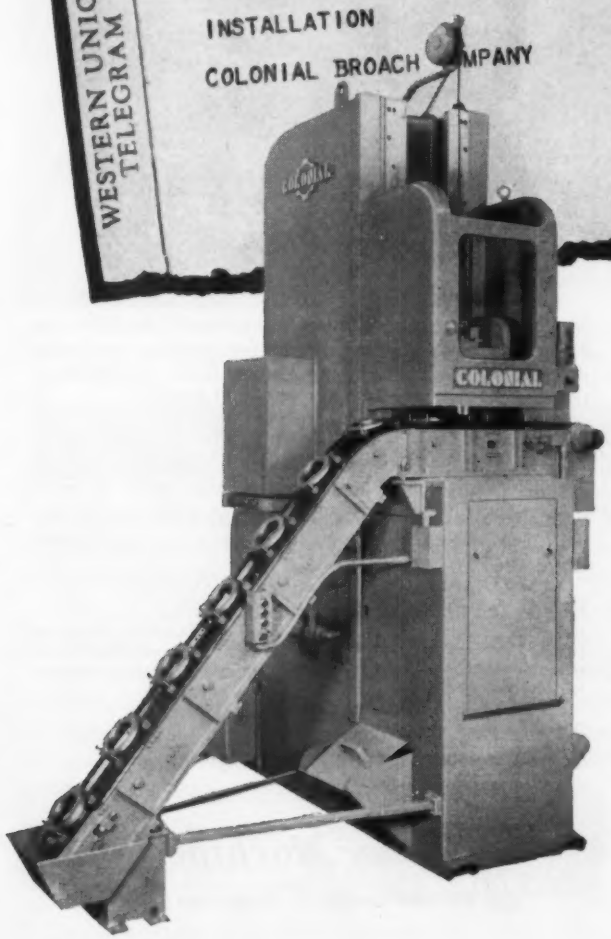
1002 Marion Rd., Mount Gilead, Ohio, U. S. A.

WESTERN UNION TELEGRAM

CMC 6 WUX MARCH 9 1955 2:05PM

EVERY 12 SECONDS INSIDE DIAMETER ON A DIFFERENTIAL RING GEAR IS BROACHED TO CLOSE LIMITS ON THIS AUTOMATED SETUP 100 PER CENT EFFICIENCY GIVES A PRODUCTION OF 300 PER HOUR OPERATOR LOADS CONVEYOR FROM FLOOR WITH FOUR STATIONS IN EASY REACH GRAVITY UNLOADS BROACHED RING GEAR BLANKS REPEATING 12 SECOND CYCLE IS (1) PULL-UP WORK STROKE (2) INDEX TO RETURN POSITION (3) RETURN STROKE (4) INDEX TO BROACHING POSITION CONTROLS ARE COMPLETELY SAFETY INTERLOCKED REQUEST BULLETIN RU-54 FOR SPECIFICATIONS ON STANDARD 15-TON 48-INCH STROKE COLONIAL PULL-UP MACHINE IN THIS UNIFIED BROACHING INSTALLATION

COLONIAL BROACH COMPANY



every 12 seconds!

PIONEERS OF M.S.S. BROACHING
COLONIAL
BROACH CO. DETROIT 13

UNIFIED BROACHING is the key to successful broaching

production begins with

Columbus Die-Tool

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

Let Columbus Die-Tool's more-than 46 years of designing and engineering experience go to work for you. Contact CDT today about your special die, tool and machinery requirements.

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AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
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Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

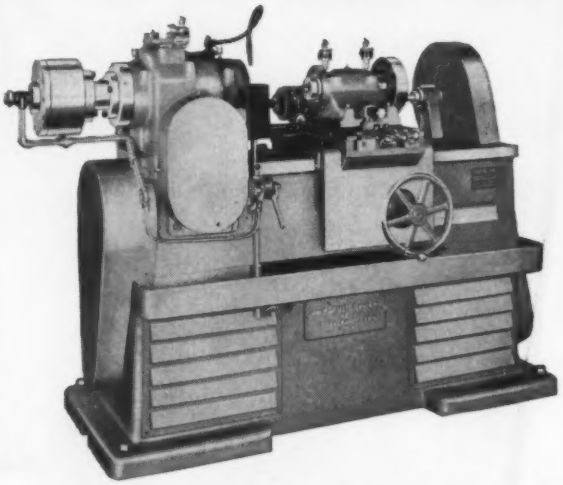
FOR HOB THREADING:

• NON FERROUS METALS
...YOU NEED HIGH SPEED!

• HEAT TREATED MATERIALS
...YOU NEED LOW SPEED!

• VERY SHORT RUNS
...YOU NEED
QUICK CHANGEOVERS!

ONLY THE COULTER "H1" GIVES ALL THREE!



Yes sir, the COULTER "H1" Hob Thread Milling Machine is the only completely automatic machine that has such outstanding exclusive features for producing precision internal and external right-hand and left-hand threads — *ON A PRODUCTION BASIS!*

In addition, it's (a) fully AUTOMATIC, (b) works equally well with universal or air operated chucks, or, special fixtures, (c) has work spindle with an extra large hole, (d) work can be inserted from face to rear end, (e) has pick-off gears and an adjustable sheave drive. ***It's the machine for you!***

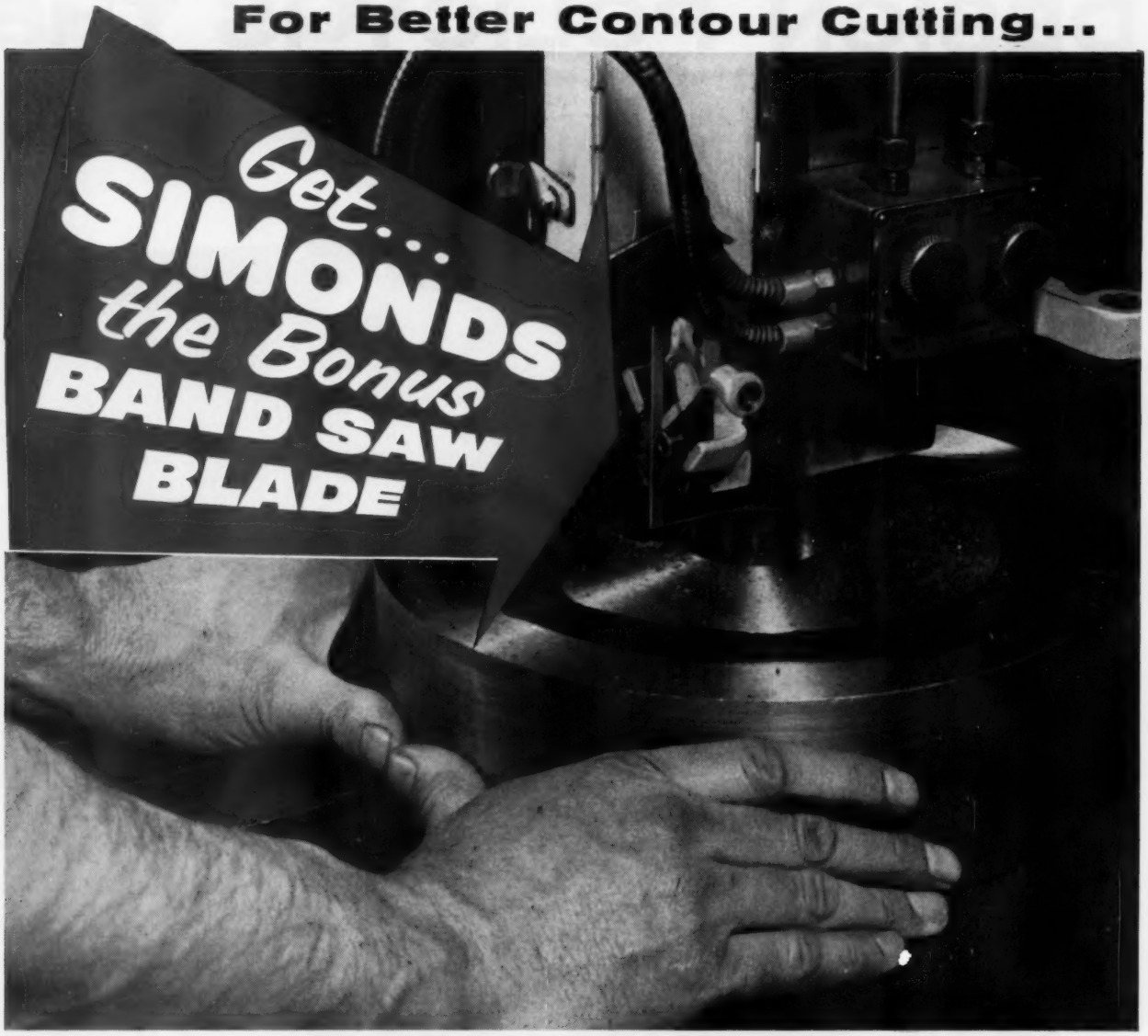
EXTRA *For Brass, Aluminum and Steel.*
The "H1" makes provision for a separate motor to give the cutter and work spindle a larger range of speeds and feeds for threading these materials.

Send for complete information on the "H1" and other Coulter Automatic Threading Machines — no obligation.

MACHINE TOOL BUILDERS SINCE 1896

The James Coulter Machine Co.
635 Railroad Ave. Bridgeport 5, Conn.

For Better Contour Cutting...



gives you more cuts, longer life, lower costs!

Here's a tough, edge-holding metal cutting band saw blade that gives you a real bonus in smooth, fast cutting and long life.

Made of extra tough, wear-resistant alloy steel, Simonds "Bonus" Bands have sharp, perfectly formed teeth — set with absolute evenness on both sides of the blade. Hardened along the tooth edge only by controlled heat treatment, they combine maximum cut-ability with flexibility and resistance to breakage, provide the ultimate in trouble-free service.

All standard widths and tooth spacings are furnished in 100′ and 250′ coils or welded to specified length. Ask your local Simonds Industrial Supply Distributor for more information on the complete line of Simonds "Bonus" Band Saws.

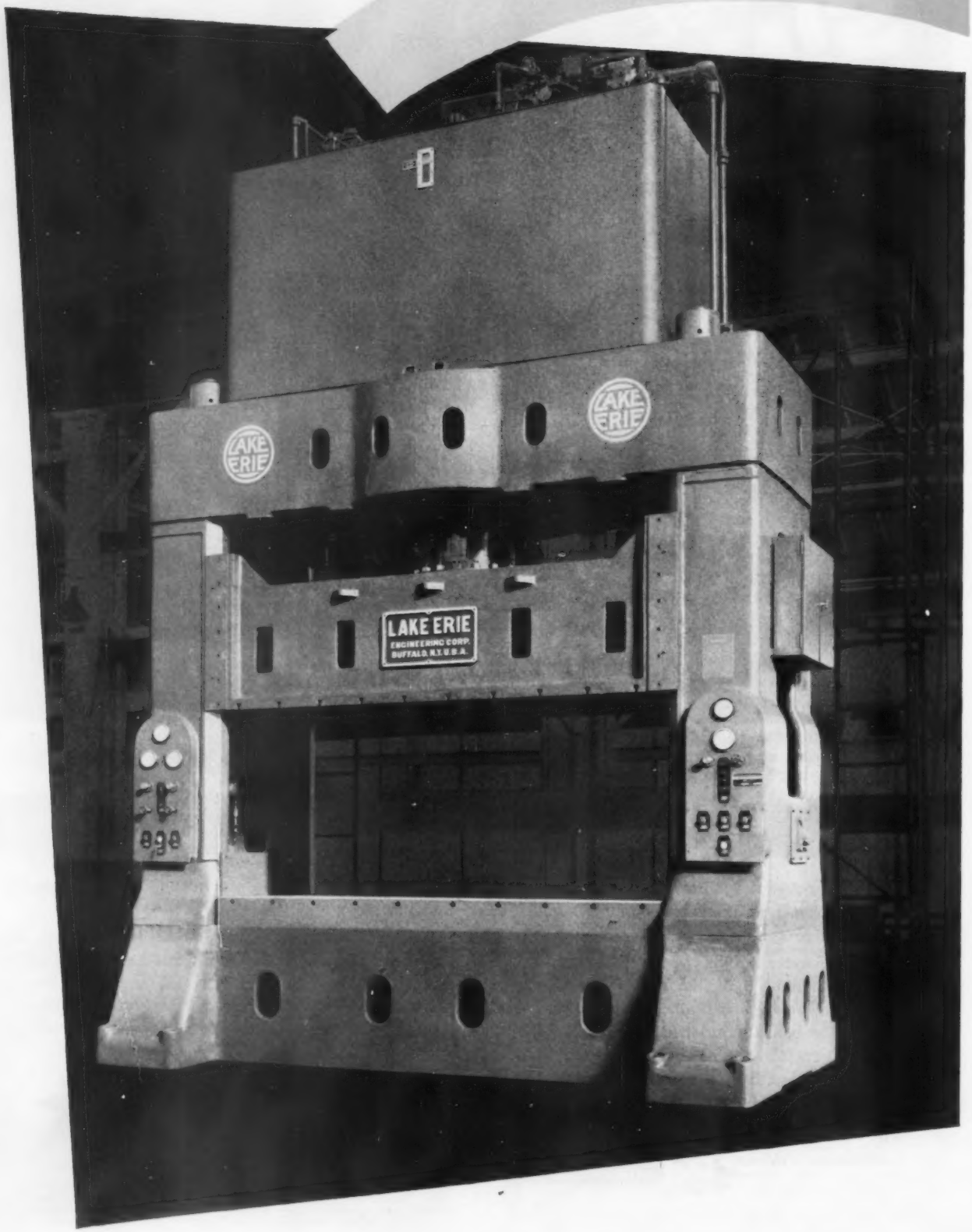
For Fast Service from Complete Stocks

Call your SIMONDS Industrial Supply DISTRIBUTOR

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que. Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

DESIGN POLICY IS THE



KEY TO SUPERIOR PRESSES

FORGED STEEL CYLINDERS... *solve problem of defective integral castings.*

HEAVIER SECTIONS... *mean lower stresses.*

LAPPED CYLINDERS AND PISTONS... *insures precision fit.*

QUICK-SET STROKE CONTROLS... *save time on set-ups.*

UNUSUALLY RUGGED SIDE HOUSINGS... *increase frame rigidity.*

FAIL-SAFE DEVICES... *in electric and hydraulic circuits.*

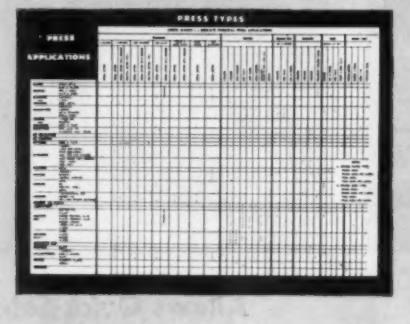
SIMPLIFIED ELECTRICAL SYSTEM... *designed for maximum safety and ease of maintenance.*

BRONZE USED EXTENSIVELY... *bronze throat bushings provide better guiding.*

... *bronze piston heads, gland bushings, and pre-fill valve disc prevent scoring.*

LAKE ERIE BUILDS THEM BETTER... Mechanically, electrically, and hydraulically, Lake Erie presses bring you the greatest number of superior features. That's why Lake Erie press users almost always return to us for additional presses. They know from experience that Lake Erie incorporates many "special" features as "standard"... features which seldom if ever form a part of customer specifications. They know that these features mean longer press life, minimum maintenance, maximum productivity. Next time, call on Lake Erie.

SEND FOR HANDY BUYER'S GUIDE



LAKE ERIE HYDRAULIC PRESSES

EXTRUSION PRESSES • DIE CASTING MACHINES
ROLLING MILL AUXILIARY EQUIPMENT

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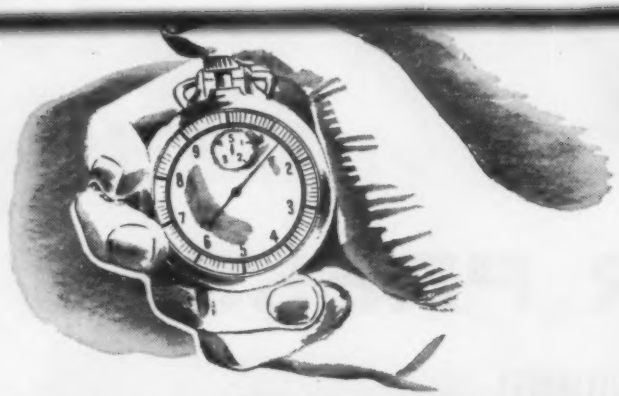
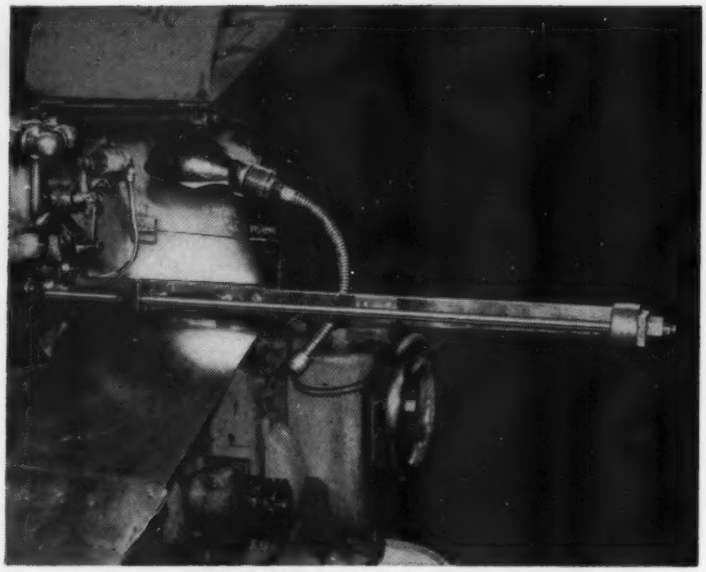


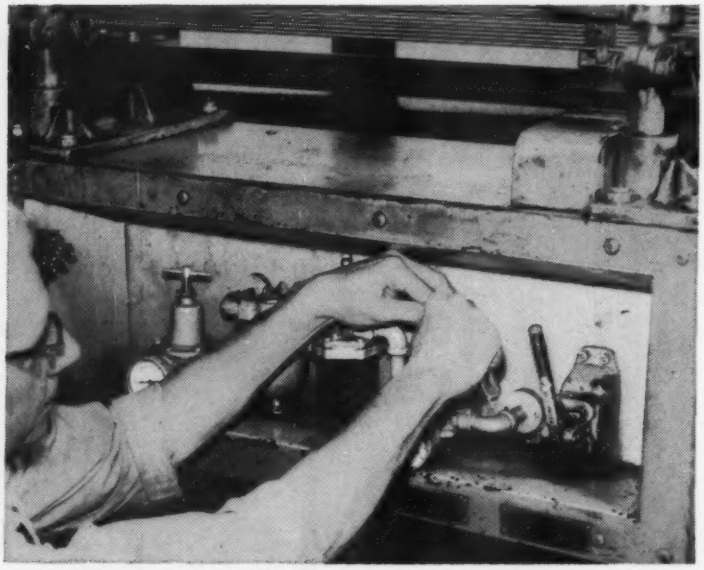
Why let the cut

Feeds Stock Continuously . . . there's no cutting air



No Repeat Motion . . . feeds any length in one feed-out

Reduces Scrap, Refinishing . . . doesn't scratch or mar polished stock

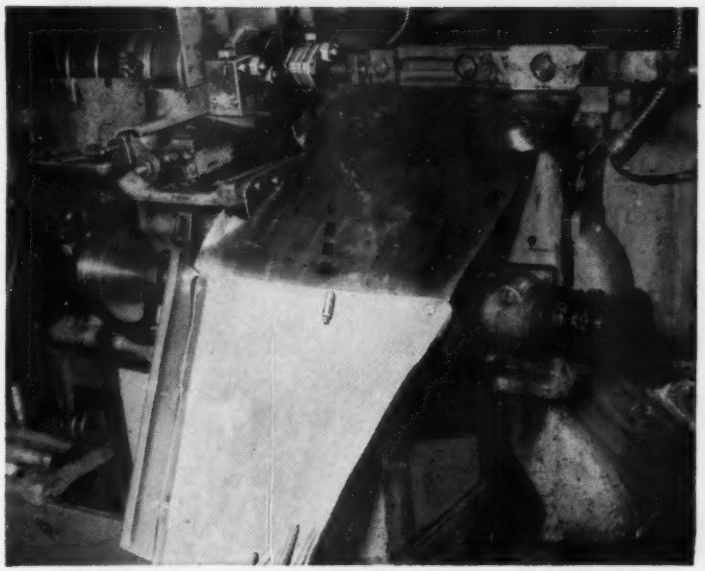


Allows Quick Set-Ups . . . no tricky adjustments for long or short runs

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION BAR FEED DIVISION

4th Dimension your production quotas?



Ejects Remnant Automatically . . . no shut-downs for remnant disposal

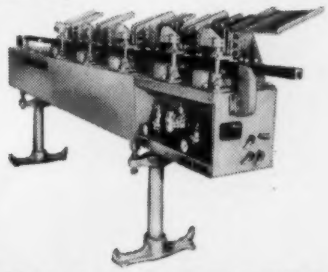
Reduces Fatigue, Slow-Downs . . . cuts nervous strain and absenteeism

Lipe A.M.L. BAR FEED boosts output 30% or more by smashing the TIME barrier

You're familiar with the three spatial dimensions on blueprints: length, width and height. But what of TIME—the important 4th Dimension that determines whether you hit or miss your production quotas?

Control Time as you control the other three dimensions—make every second perform a productive function—and you're on your way to more efficient machine use . . . new production highs . . . lower per-piece costs!

The Lipe A.M.L. (Automatic Magazine-Loading) Bar Feed converts the normal series of stop-wait-go machining cycles into one continuous, uninterrupted flow. Despite hour of day, temperature, inattention, operator skill or fatigue, it supplies stock constantly to the machine—never losing a productive second as the clock ticks on.



LIPE A.M.L. BAR FEED

The A.M.L. is an air-operated attachment which automatically feeds an 8-hour supply of bars, rods or tubing to any machine tool equipped with a stop to establish feed length. It can be put to work on practically every type of single spindle screw machine, turret lathe, centerless grinder, abrasive-wheel cut-off, punch press, cold header or die machine.

You can expect at least a 30% increase in production—that's Lipe's *guarantee*. Users report gains up to 266% due to the six features illustrated on the left. The whole story of what the A.M.L. can do for you is described in a free booklet we'll be glad to send you. Mail coupon for your copy.

LIPE-ROLLWAY CORPORATION
Bar Feed Division
Syracuse 1, N. Y.

Please send free 24-page illustrated booklet, "The Important 4th Dimension of Production and Profit."

Name.....

Title.....

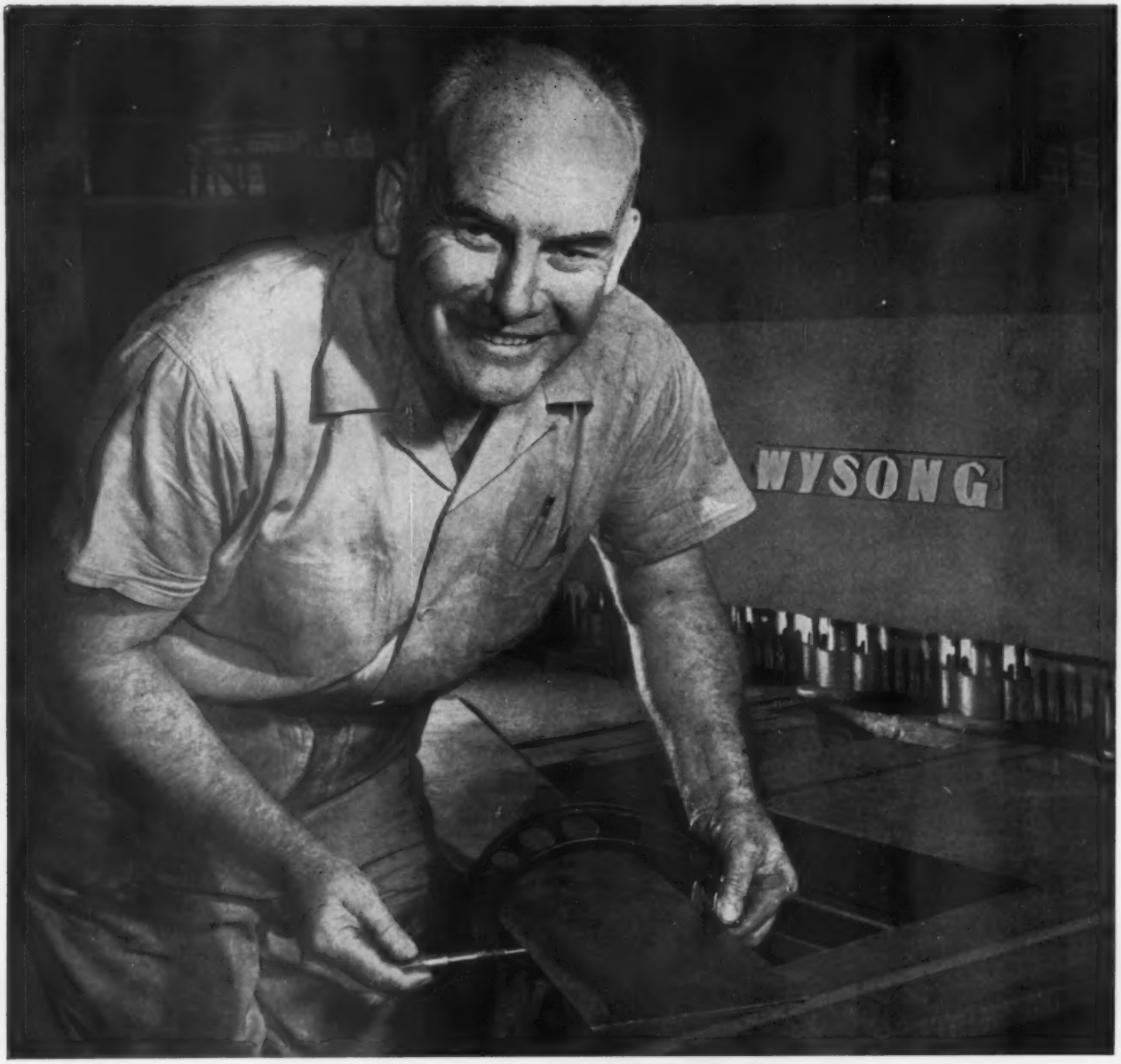
Firm.....

Address.....

SYRACUSE 1, N. Y.

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION BAR FEED DIVISION



SHEAR SATISFACTION!

When you use a Wysong, you will know what I mean—a clean, *accurate* cut and complete confidence that the next cut will be just like it.

Wysong Shears are designed and built for that kind of shearing — rugged enough to withstand the shock of capacity shearing, rigid enough to maintain accurate alignment.

You will want to know about the rigid, hi-tensile castings; the drive unit which runs in oil; the non-repeat unit; the positive, compensating holddown; the ball-bearing precision back gauge; and other superior Wysong features. They add up to SHEAR SATISFACTION—for the boss and the operator, too.

Before you buy, investigate WYSONG . . . it's MILES ahead! See your dealer or write factory for new catalog.

WYSONG

WYSONG AND MILES COMPANY • GREENSBORO, NORTH CAROLINA

Builders of Precision Machines For Over Fifty Years.

SYRACUSE 1, N. Y.

Address.....

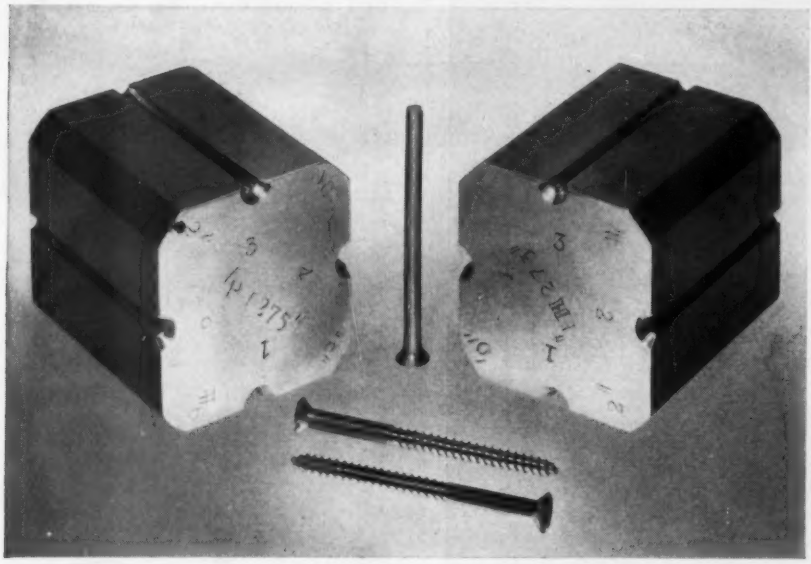
Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



150,000 Screw Blanks per Dressing with This Cold-Heading Die Steel

Shown here are representative header and gripper dies used in the manufacture of wood screws by Southern Screw Company, Statesville, N. C. Made of Bethlehem Cold-Heading Quality Carbon Tool Steel, the dies are hardened to Rockwell C 59/61. They are working tools of a cold-header, and form steel, brass or aluminum stock into screw blanks, turning out up to 150,000 blanks before redressing is required.

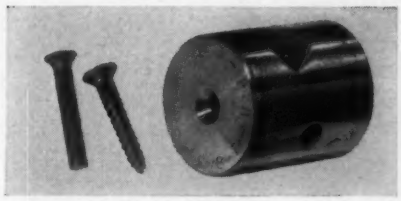
Southern Screw Company reports that they like this grade of Bethlehem Tool Steel because of its ease of machinability, uniformity of heat-treatment, minimum distortion in heat-treatment, good wear-resistance, and good shock-resistance.

Bethlehem Cold-Heading Quality Carbon Tool Steel is a superior grade of tool steel, intended for specialized types of tools where cleanliness and hardenability are important.

TYPICAL ANALYSIS

Carbon, 0.90 to 1.00
Phosphorous, 0.020 max
Sulphur, 0.020 max

Bethlehem Cold-Heading Carbon Tool Steel has high shock-resistance because it is accurately controlled for hardenability. Its controlled carbon range results in good wear-resistance, and provides the toughness to withstand cold battering.



Ask your tool steel distributor to send you a trial order of Bethlehem Cold-Heading Carbon Tool Steel. You're sure to be pleased with the way it performs.

• • • • • • • • •

DIE OF 67 CHISEL GIVES GOOD SERVICE IN MAKING PART FOR REFRIGERATOR

This blanking, drawing and forming die, made of Bethlehem 67 Chisel Tool Steel and hardened to Rockwell C 52, is used in producing refrigerator unit end caps for a manufacturer of appliances. The caps are made from steel, 3/8 in. thick, approximately 90,000 pieces being turned out before redressing is required. 67 Chisel, our general-purpose, tungsten-type of shock-resisting tool steel, is well known for its wear-resistance, and also for its low distortion in heat-treatment.

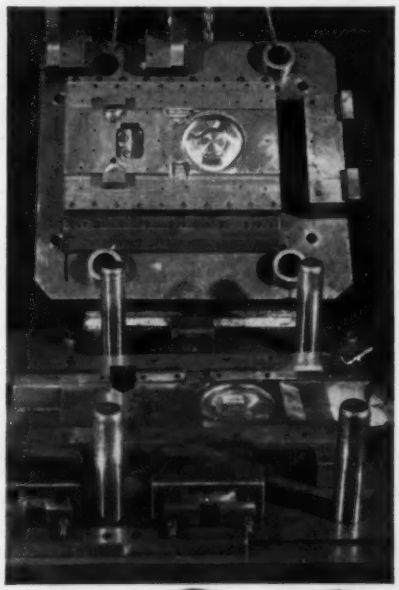
BETHLEHEM TOOL STEEL ENGINEER SAYS:

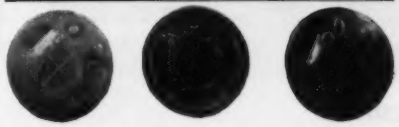
Bake Tools After Plating

Electroplating with chromium or nickel is often used to salvage tools by regaining worn dimensions, or to correct mechanical errors. It is also used for decorative purposes, and is sometimes advantageous for resisting wear or metal pickup.

Plating of hardened tools is relatively simple. Yet it can be a hazardous operation if it is not followed by tempering or baking. During deposition of the plated metal, a considerable amount of hydrogen is deposited on the tool, and some of it diffuses into the tool, causing extreme brittleness. If the tool is used immediately after plating, breakage in service may occur. To avoid this possibility, temper the tool at from 300 to 400 F for at least four hours, so as to restore its original ductility. This should be done as soon as possible after plating.

Grinding should never be attempted on the steel itself prior to tempering. If tempering is omitted, the tool will gradually recover its ductility at room temperature in from two to three weeks, but will be subject to breakage if used earlier.





FOR HIGH PRODUCTION THREAD ROLLING MACHINES

ELCO SCREWS

comes to

HARTFORD *Special*

THE HARTFORD SPECIAL MACHINERY CO. · HARTFORD 12, CONN.

HERE'S A **Frame-up** TO GIVE YOU *MORE* FOR YOUR MONEY

These two new Star Hack Saw Frames provide convenience features and quality features found in no other frames.

NEW STAR No. 10

Green Tenite handle, one-piece, heat treated, solid steel back with long-wearing, rustproof, crackle finish, and 12-inch Star Unbreakable Special Flexible Blade,

$1.89 LIST PRICE

EXAMPLE:

Blades are easily, instantly changed simply by moving the exclusive STAR cam-action lever under the handle.

EXAMPLE:

A quick, simple movement of the tension bar adjusts for 10-inch or 12-inch blades.

NEW STAR No. 15

Red Tenite handle, one-piece, heat treated solid steel back with smooth, high-gloss rustproof finish, with Star "Moly" High Speed Blade,

$2.49 LIST PRICE

$3.25 LIST PRICE

STAR No. 20

long the top-quality favorite of mechanics.

Order from Your Star Distributor

CLEMSON BROS., Inc.

MIDDLETOWN, N. Y., U.S.A.

Makers of Hand and Power Hack Saw Blades, Frames, Metal and Wood Cutting Band Saw Blades and Clemson Lawn Machines. 1412

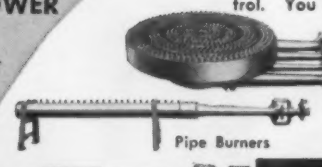
BUZZER Reg. U. S. Pat. Off.

NO BLOWER OR OTHER POWER NEEDED

JUST CONNECT TO GAS SUPPLY

INDUSTRIAL *GAS* EQUIPMENT

BUZZER Equipment, a buy-word since 1911, provides the hottest and quickest heating . . . without blower or power. Wide range of turn down and heat control. You can depend on a BUZZER.



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Pipe Burners

Nozzle Burners

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Mfrs. since 1911

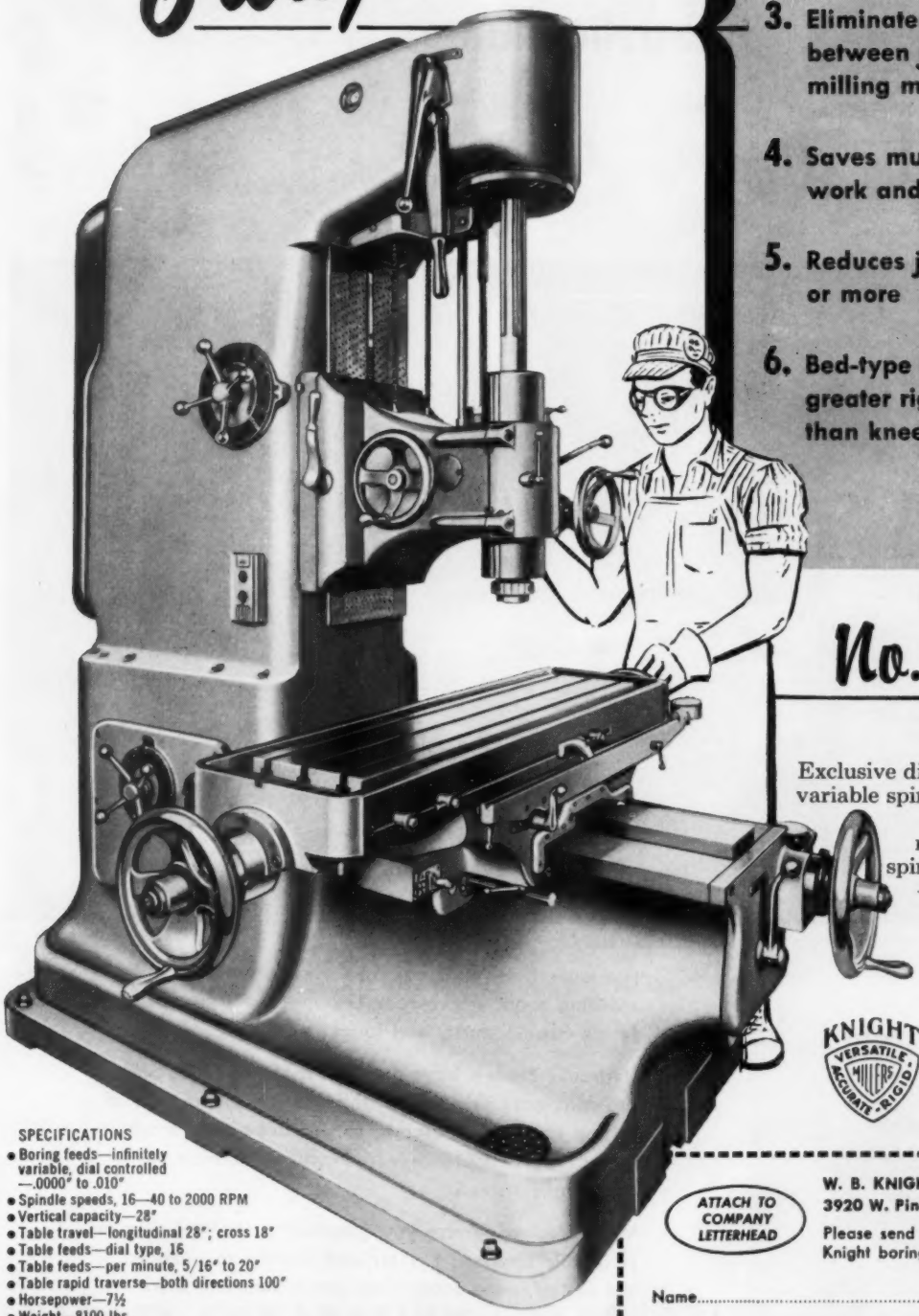
CHARLES A. HONES, Inc.

126 SO. GRAND AVE., BALDWIN, L. I., N. Y.

BURNERS - FURNACES (Heat Treating, Melting, Soldering)

How 1 Machine Can Save Time & Money 6 Ways!

1. A precision jig borer with extra talent!
2. Also handles an extreme range of difficult milling operations
3. Eliminates work transfers between jig borers and milling machines
4. Saves much of the layout work and preliminary drilling
5. Reduces job time up to 50% or more
6. Bed-type table guarantees greater rigidity and accuracy than knee-type



KNIGHT'S No. 50

Exclusive dial-controlled infinitely variable spindle feeds—Extra-long travel of the 1-piece roller bearing-mounted spindle increases capacity—Quick-action controls all operated from 1 position—Rugged, rigid construction for accuracy—Power to spare—Many other time-&-money-saving features!

KNIGHT VERSATILE MILLERS ACCURATE · RIGID

SPECIFICATIONS

- Boring feeds—infinitely variable, dial controlled —.0000" to .010"
- Spindle speeds, 16—40 to 2000 RPM
- Vertical capacity—28"
- Table travel—longitudinal 28"; cross 18"
- Table feeds—dial type, 16
- Table feeds—per minute, 5/16" to 20"
- Table rapid traverse—both directions 100"
- Horsepower—7½
- Weight—8100 lbs.

W. B. KNIGHT MACHINERY CO.
3920 W. Pine Blvd. St. Louis 8, Mo.

ATTACH TO COMPANY LETTERHEAD

W. B. KNIGHT MACHINERY CO.
3920 W. Pine Blvd., St. Louis 8, Mo.

Please send catalog on No. 50 and other Knight boring and milling machines.

Name.....

Title.....

☐ Send information on Knight's 20" and 42" Rotary Tables.

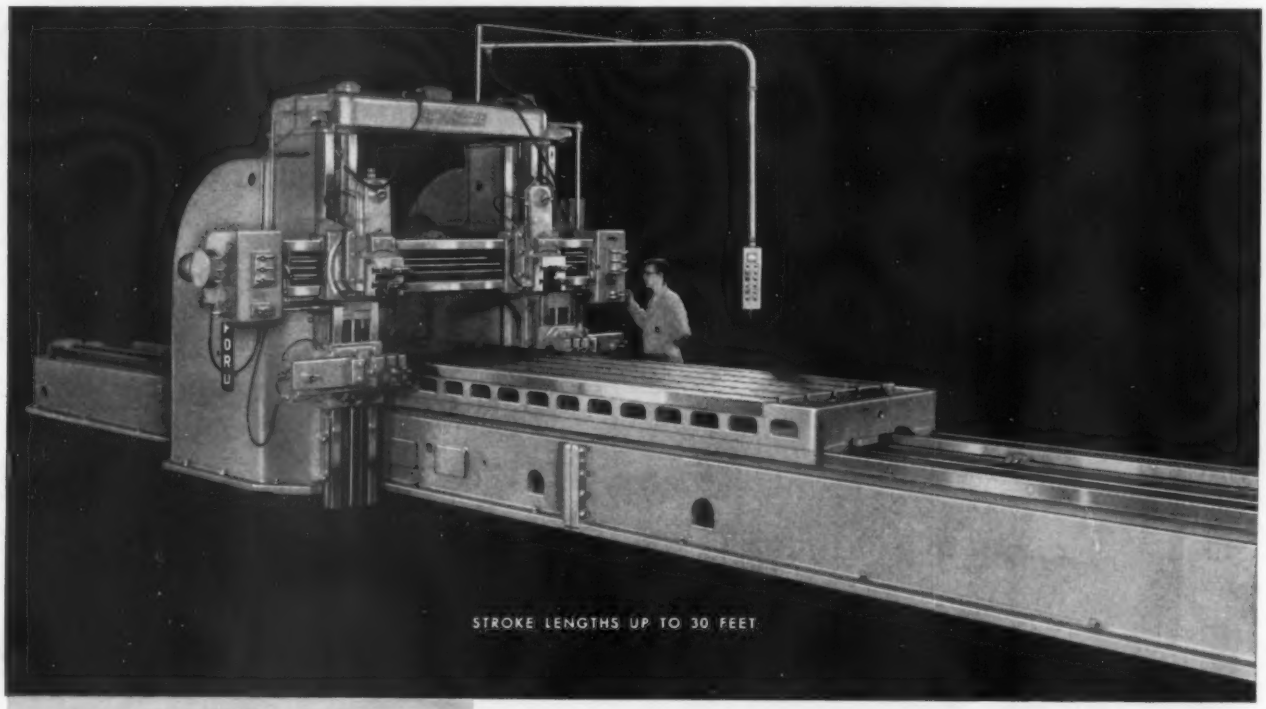
HYDRAULIC

fast, economical production calls for

HYDRAULIC

hydraulic planers with exclusive triple circuit

HYDRAULIC



STROKE LENGTHS UP TO 30 FEET

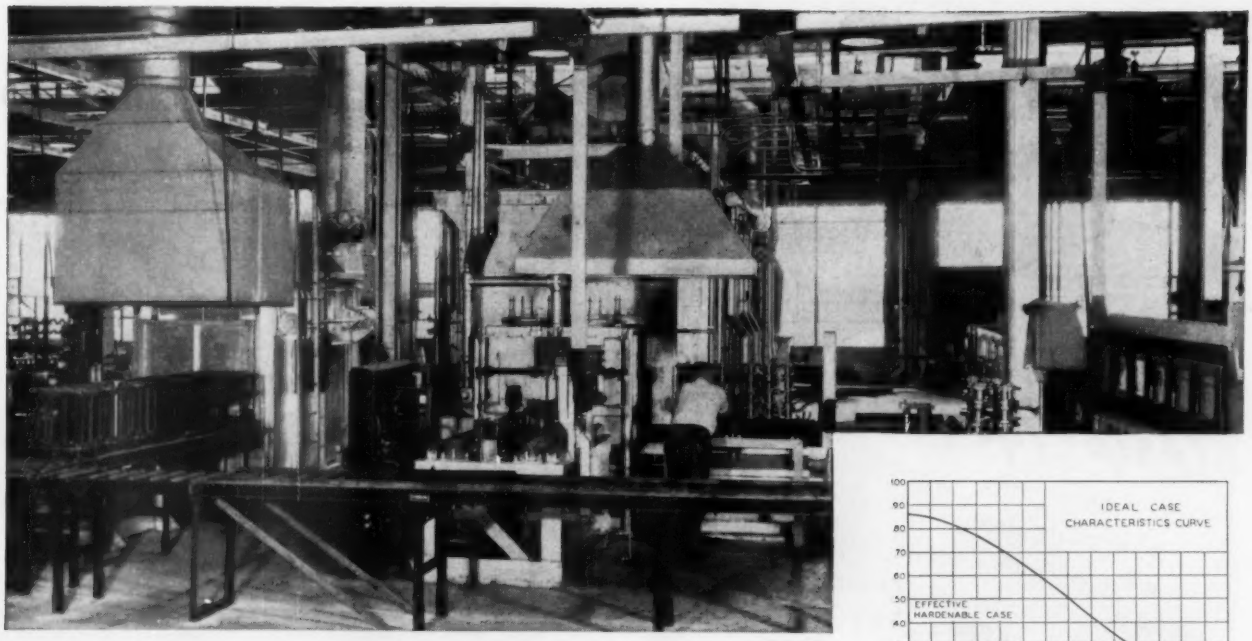
Hy-Draulic

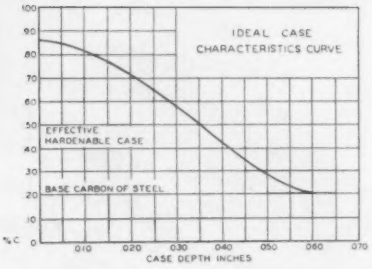
Hydraulic Drive is a natural for reciprocating-type machine tools. It provides smooth, powerful cutting, fewer moving parts, and longer useful life.

Hydraulic Planers have the new Triple Circuit which provides easy selection of the correct combination of cutting speed and force to most economically machine every type of material — free-cutting materials to the toughest steels.

When you modernize your production facilities plan on Hydraulic Shapers, Planers and Slotters to provide the fastest, most economical production methods.

ROCKFORD MACHINE TOOL CO.
2500 Kishwaukee Street • Rockford, Illinois





on the nose every time

WITH SURFACE AUTOCARB AUTOMATIC CARBON POTENTIAL CONTROL

New high physicals in carburized gears—better tooth-to-tooth and gear-to-gear uniformity—faster cycles—automatic compensation for changes in work surface area during furnace operation . . .

These are the chief benefits Warner Gear Division, Muncie, Ind., achieves in its most recent continuous gas carburizing line, using the 'Surface' fully automatic carbon potential control system. In a nutshell: The Surface dewpoint recorder-controller periodically checks carbon potential in each of three zones in the furnace (with a range of .3 to 1.1% carbon), controls mixing valves to deliver correct additions of air or gas to maintain desired carbon potential in each zone. This system eliminates the human element in controlling carbon potential. It also provides Warner Gear with the necessary close control required for the practical carburizing of gears with near-eutectoid surface carbon concentrations.

Write for Literature H-54-2.

Surface
HEAT TREATING EQUIPMENT

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF

Kathabar HUMIDITY CONDITIONING *Janitrol* AUTOMATIC SPACE HEATING

NEW *Grip-Tip* CENTERS

CHECK THESE *Grip-Tip* FEATURES

- Long-Life Holders
- Replaceable Carbide Tips
- Easy Insertion and Removal of Male or Female Tips
- Reduced Machine Down-Time
- Lower Cost for Replacement of Carbide Tips
- Carbide Tips Accurate to .0005"
- No Regrinding of Holder
- Carbide Tips Are Easy and Inexpensive to Stock
- Reduced Regrinding Time
- Longer Diamond Wheel Life

with REPLACEABLE CARBIDE TIPS

Grip-Tip Centers are specifically designed to substantially reduce your replacement costs and machine down-time for regrinding or replacement of worn or chipped centers.

Male or female carbide tips are inserted or removed from the tool steel holders by simply turning a screw. The unique clamping action of holders on tips is positive and quick . . . you save replacement time with Grip-Tip Centers.

The life of Grip-Tip holders is practically unlimited, for, only the dull or chipped carbide tips are reground. Because the steel holder is not ground when sharpening the carbide tip there is less clogging and longer life for your diamond wheels. Also, the relatively inexpensive double end tips in both male and female types can be stocked with a minimum investment . . . Grip-Tip Centers reduce tool and inventory costs.

Grip-Tip Centers increase your production by permitting full utilization of machine tools. It takes but a minute to remove old carbide tip and replace with a new one . . . machine down-time is less with Grip-Tip Centers.

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HOW WOULD YOU SOLVE IT?

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2. SOLUTION. He suggested that the manufacturer switch to the 3M Method using Three-M-ite Resin Bond Cloth Belts. This method allowed operators to grind flash from white metal bolsters, finish brass rivets, shape and blend cocobolo wood handles and steel tangs to size—*in just one operation!*

3. RESULTS. An immediate increase in production with each belt finishing 1,900 handles. Smoother, more uniform finishes at lower unit costs. A 3M Representative can help you solve your grinding and finishing problems, too. His services are available without cost or obligation. Call him today.

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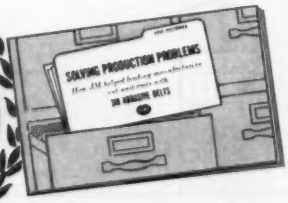

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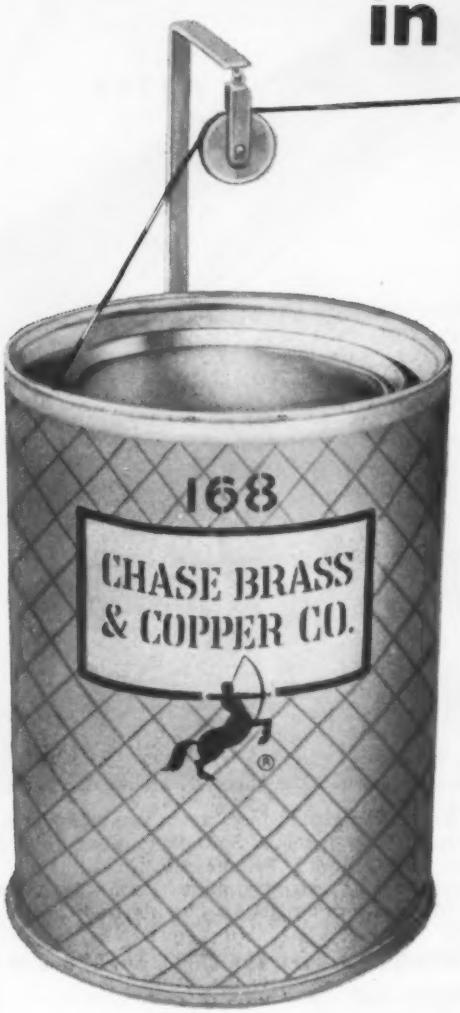

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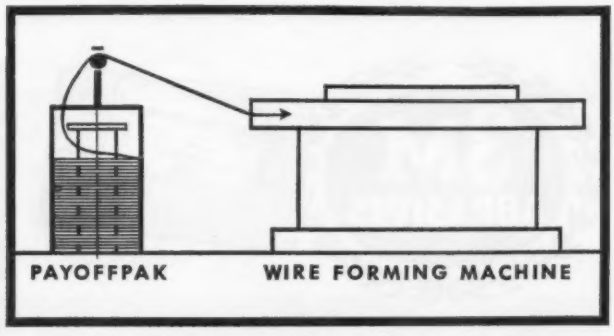

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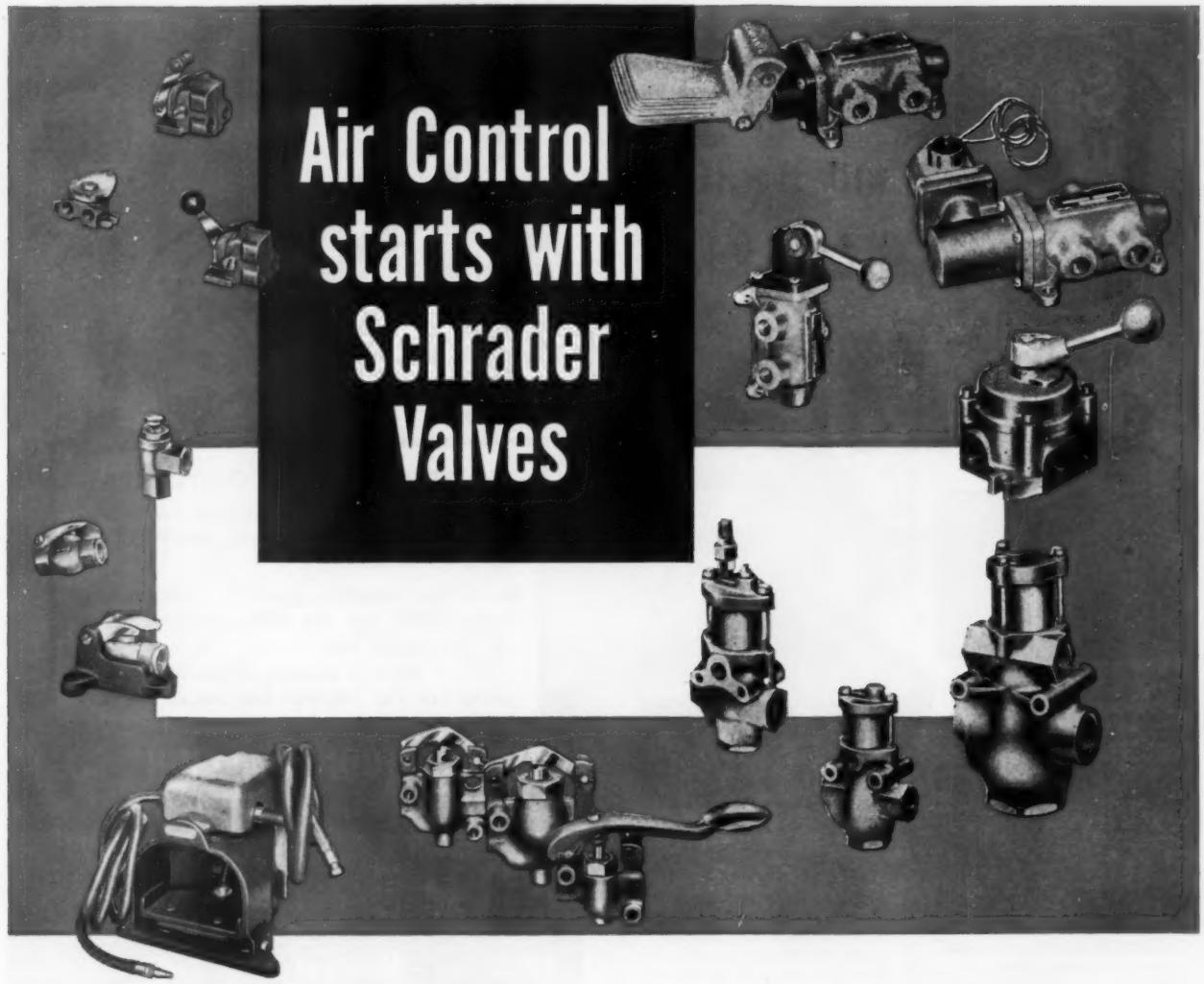

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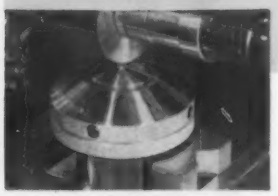

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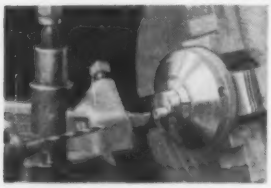

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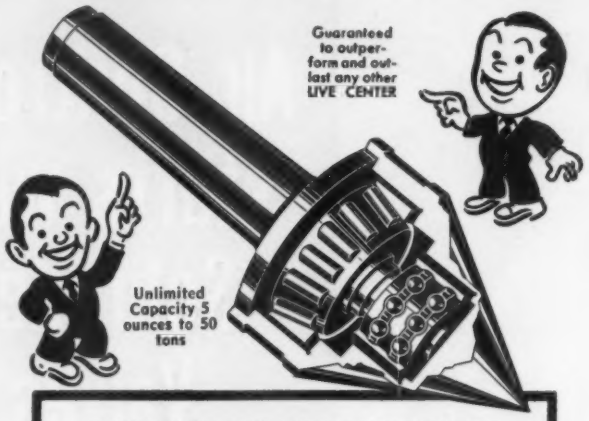

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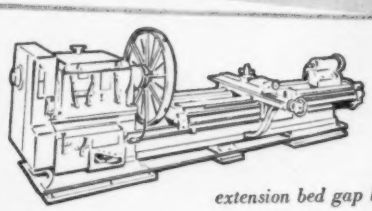
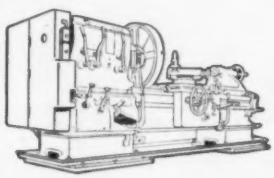


extension bed gap lathes



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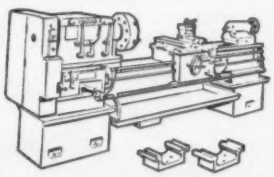

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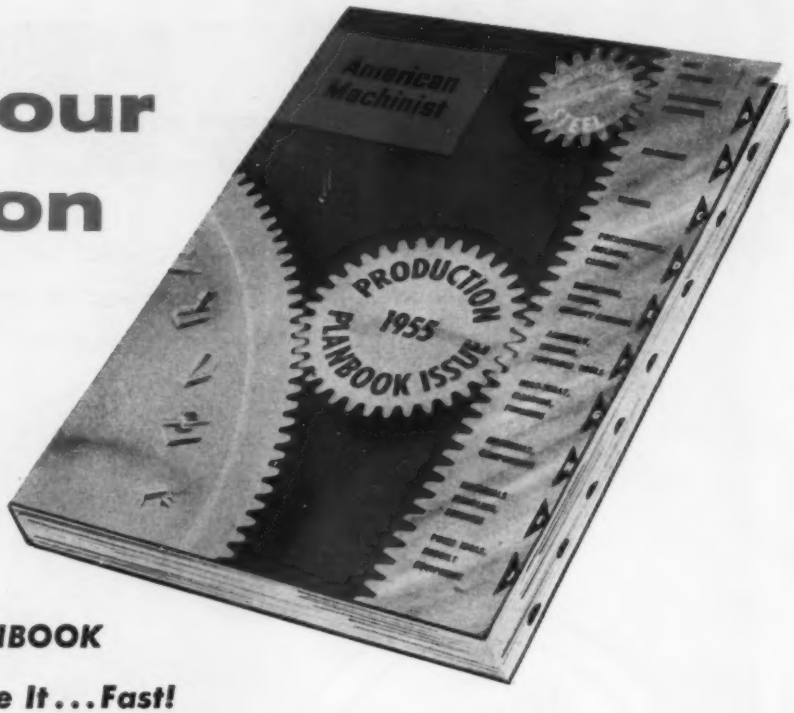

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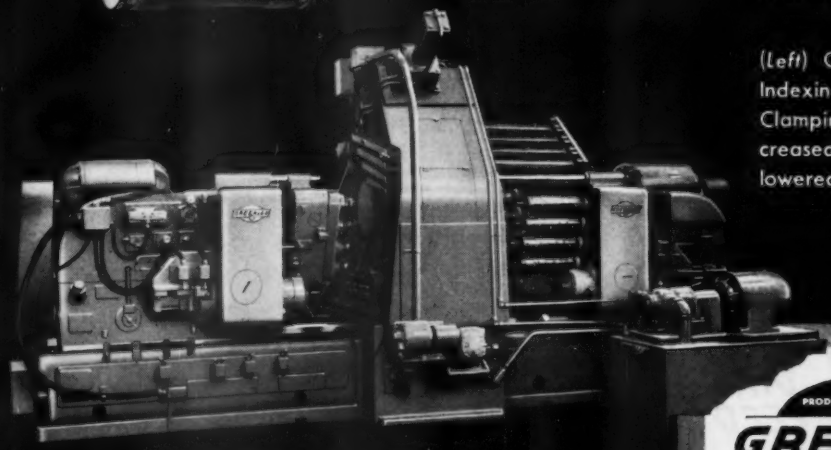
Wheel cylinder machined on Greenlee Special Machine shown below.

(*Above*) Greenlee Horizontal Indexing Machine designed for processing master brake cylinders has proved itself with raised quality and lowered costs.

(*Left*) Greenlee Two-Way Horizontal Indexing Machine equipped with Power Clamping and Automatic Unloading increased previous production rates and lowered costs.



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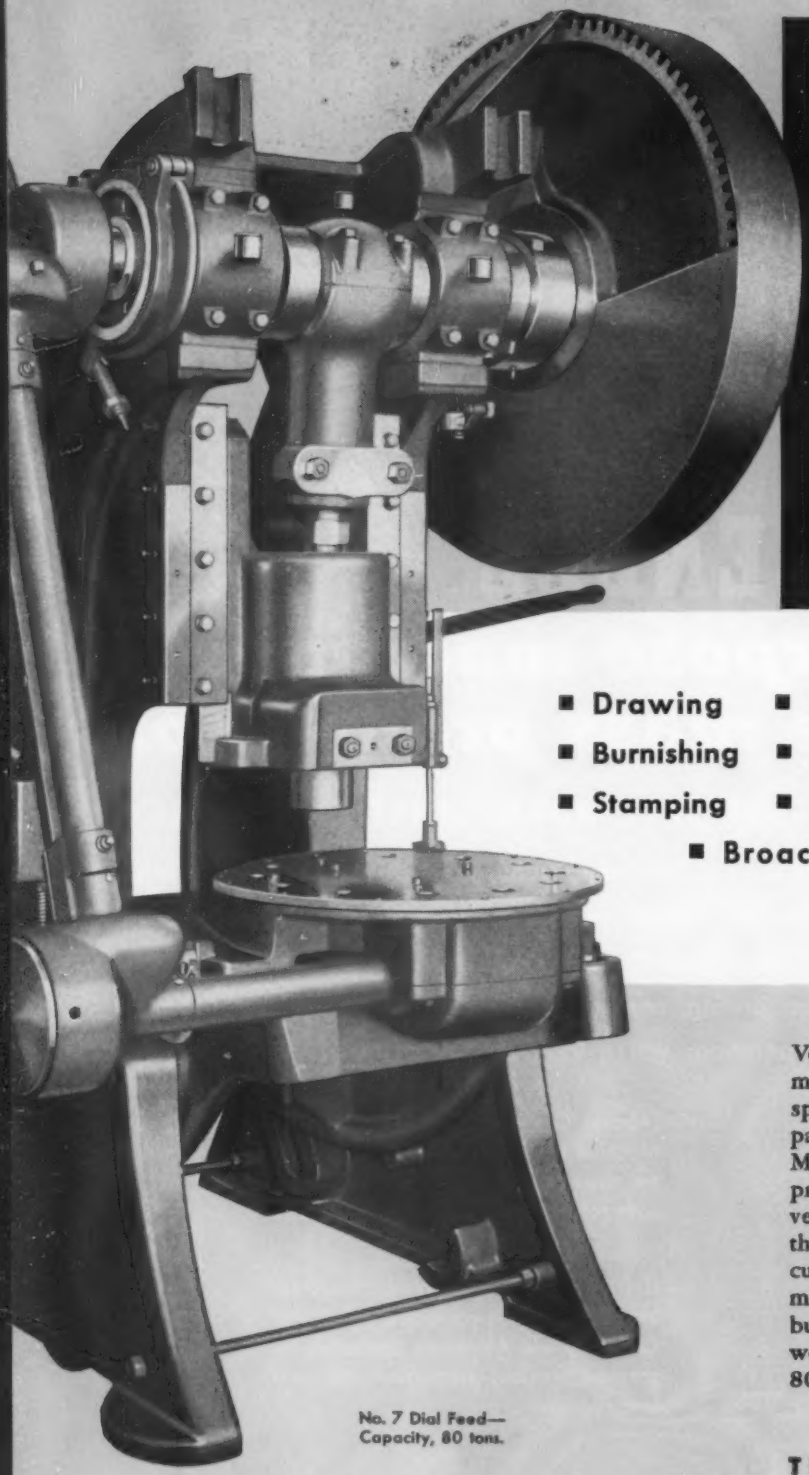

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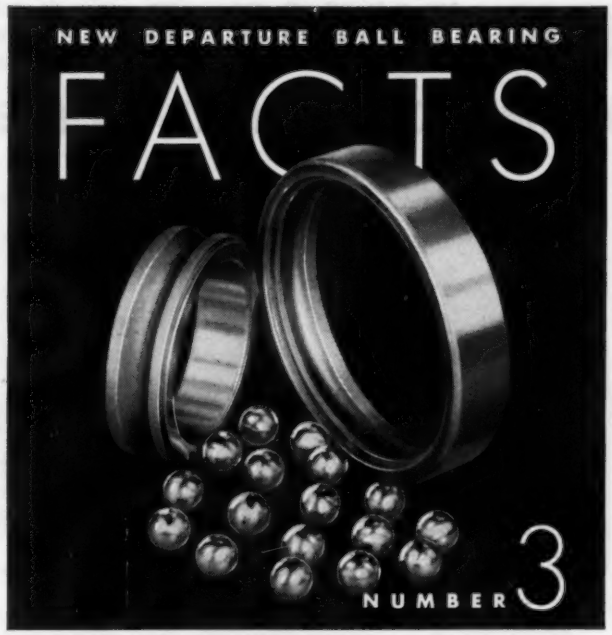
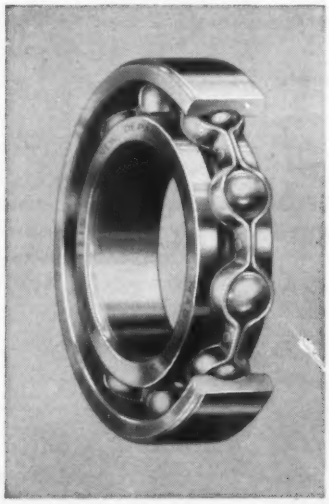
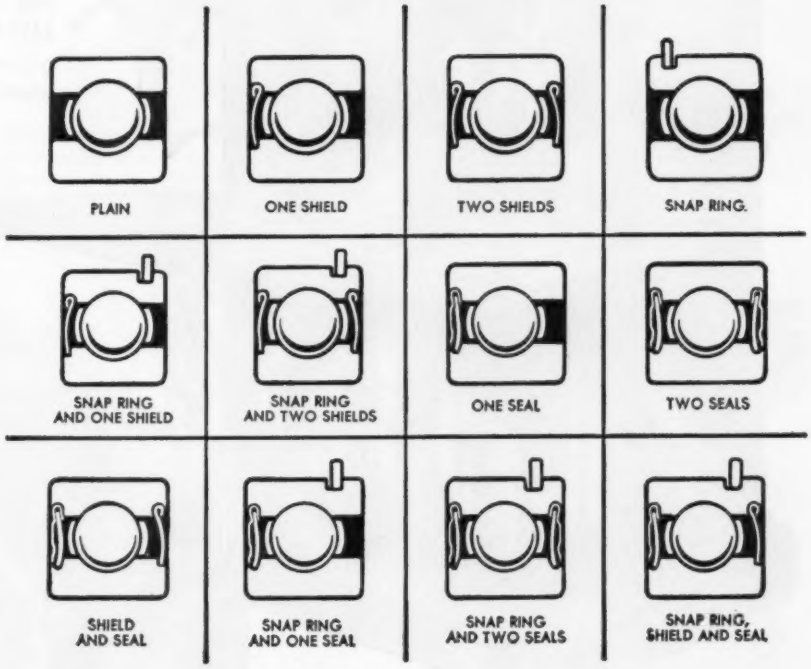


This "wardrobe" fits standard ball bearings to CUSTOM OCCASIONS

Versatile is the word for New Departure standard ball bearings! For these bearings may be obtained in a wide range of *standard* variations (as shown below), opening a tremendous range of uses to the engineer. In other words, a standard bearing has a "wardrobe" which fits it for very nearly any occasion!



New Departure Single Row Conrad-type bearings, with standard variations available, illustrate the "wardrobe" principle which makes these ball bearings, with their dual load-carrying ability, the most readily adaptable of all bearing types.



Virtually any mounting or operating requirement within a wide range of usage is met perfectly by a *standard* New Departure ball bearing, in conjunction with shields, seals, snap ring, or combinations thereof. Shields protect the bearing from ordinary dirt both before and after mounting and, in many cases, provide adequate retention of lubricant. Seals give positive protection against dirt of every kind and make possible enclosed lubrication for extended or even lifetime service. Snap rings allow positive location in housings lacking inside shoulders. Whenever a design or engineering problem involves ball bearings, think of New Departure. Highly experienced ball bearing engineers are always ready to work with you.

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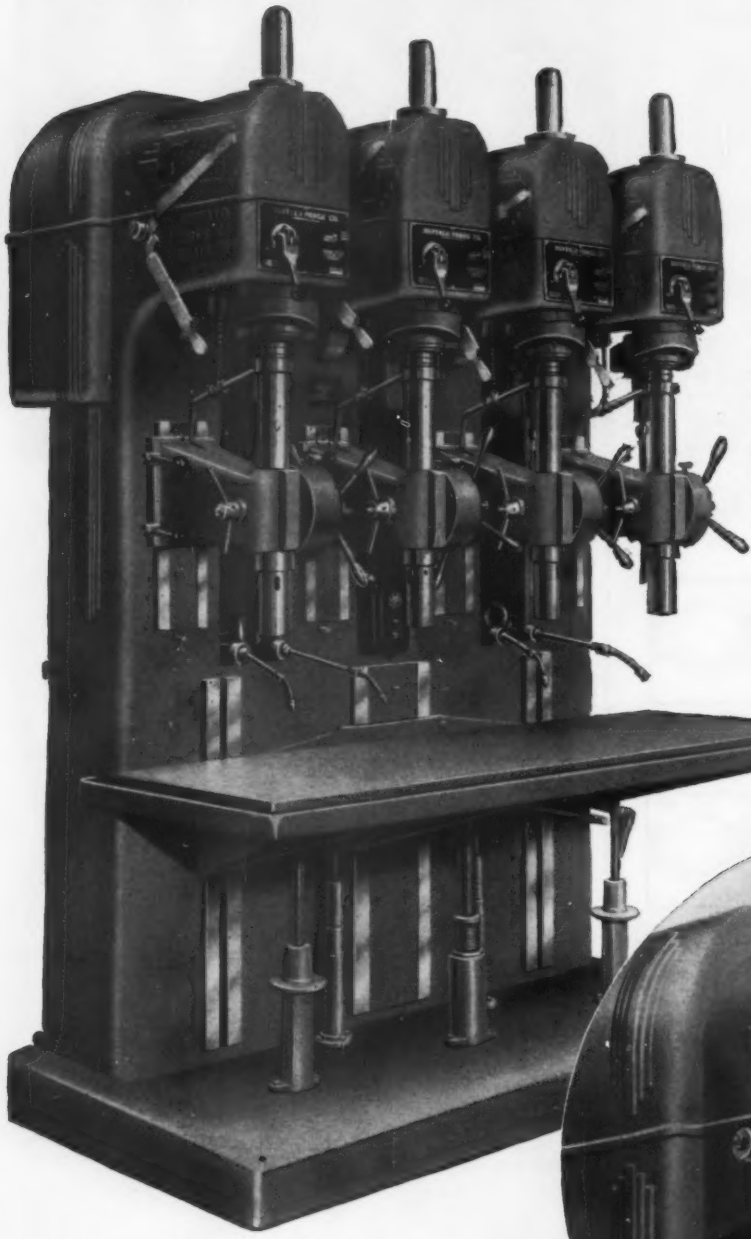
ON THESE PAGES — THE ANSWER

NAME CAPACITY—STYLE—NUMBER OF SPINDLES



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BELOW: handle on left gives instant speed selection — handle on right shifts into back gear, on the RPMster.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

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TO YOUR DRILLING PROBLEM

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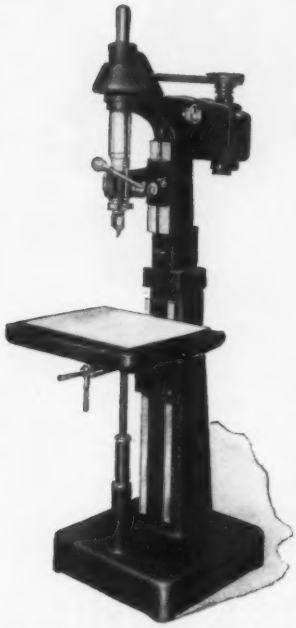

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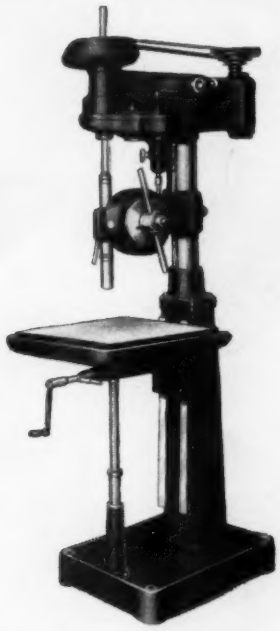
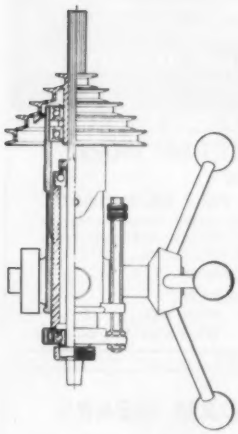


SENSITIVE OR POWER FEED; 8", 12" or 15" overhangs; models up to 6 spindles with coolant system—the 7/8" capacity No. 16 "Buffalo" Drill is a best buy in its size. WRITE FOR BULLETIN 2730G.

PRODUCTION FAVORITE! The husky 1" capacity No. 18 Drill offers 19 models. Choice of number of spindles, floor, pedestal and bench models to meet the most particular requirements. WRITE FOR BULLETIN 3123.



LASTING ACCURACY, EASY OPERATION! The "Buffalo" spindle is turned, ground and polished of high grade steel; turns smoothly and without end-play on precision ball bearings. Its six splines are fitted so accurately to the broached pulley that up-and-down motion is almost effortless.

ALL-AROUND RUGGED ½" DRILL — the "Buffalo" No. 15 is available in a very wide choice of arrangements, attachments. Single or multiple heads. A true production tool. WRITE FOR BULLETIN 2963G.

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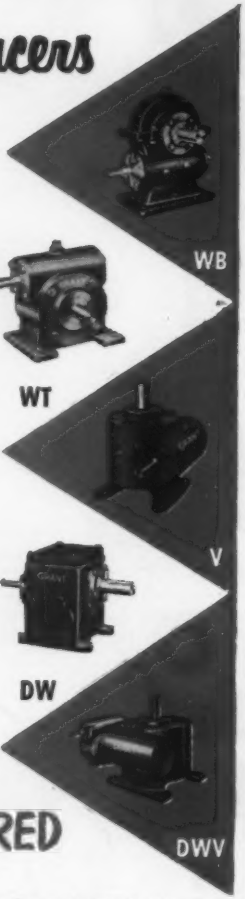
ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

for trouble-free service

Grant Speed Reducers pay off!



Whatever your speed reducer requirements, GRANT can supply any one of eight different types, each manufactured in a complete range of sizes.

Or if your need be something special, GRANT will make a Speed Reducer to your specifications.

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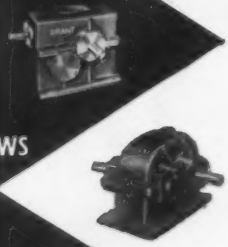

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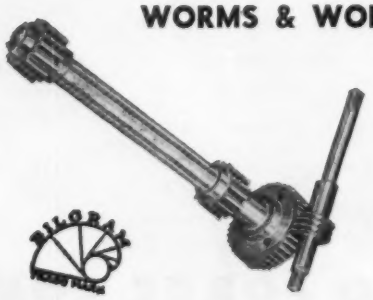
1304-06 Diversey Parkway Chicago 14, Illinois

WORMS & WORM GEARS



•

ALL TYPES AND ALL MATERIALS

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BILGRAM GEAR & MACHINE WORKS

1217-35 Spring Garden, Philadelphia, Pa.

Typical application for Atlantic cutting oils, showing a Barber-Colman milling machine.

NEW ATLANTIC cutting oils

for high production on tough jobs

Here at last is really effective help in keeping production high in your milling, turning, and drilling departments.

With these new Atlantic non-soluble cutting oils, you can maintain high production rates without the handicap of foul odors on hot tough jobs. Work is visible right through the oil. And the oils are compatible when blended—even down to the heaviest grades. Operators like these new oils better too, because they don't indelibly stain hands or clothing.

Get complete information on these new oils and your copy of the Atlantic Cutting Oil Selection Chart. Learn about this superior measure for cutting oil efficiency . . . determined by performance rather than chemical composition. Write your nearby Atlantic office listed below, or The Atlantic Refining Company, 260 South Broad St., Philadelphia 1, Pa.

ATLANTIC

LUBRICANTS · WAXES
PROCESS PRODUCTS

PROVIDENCE, R. I. 430 Hospital Trust Bldg.
SYRACUSE, N. Y. Salina and Genesee Sts.
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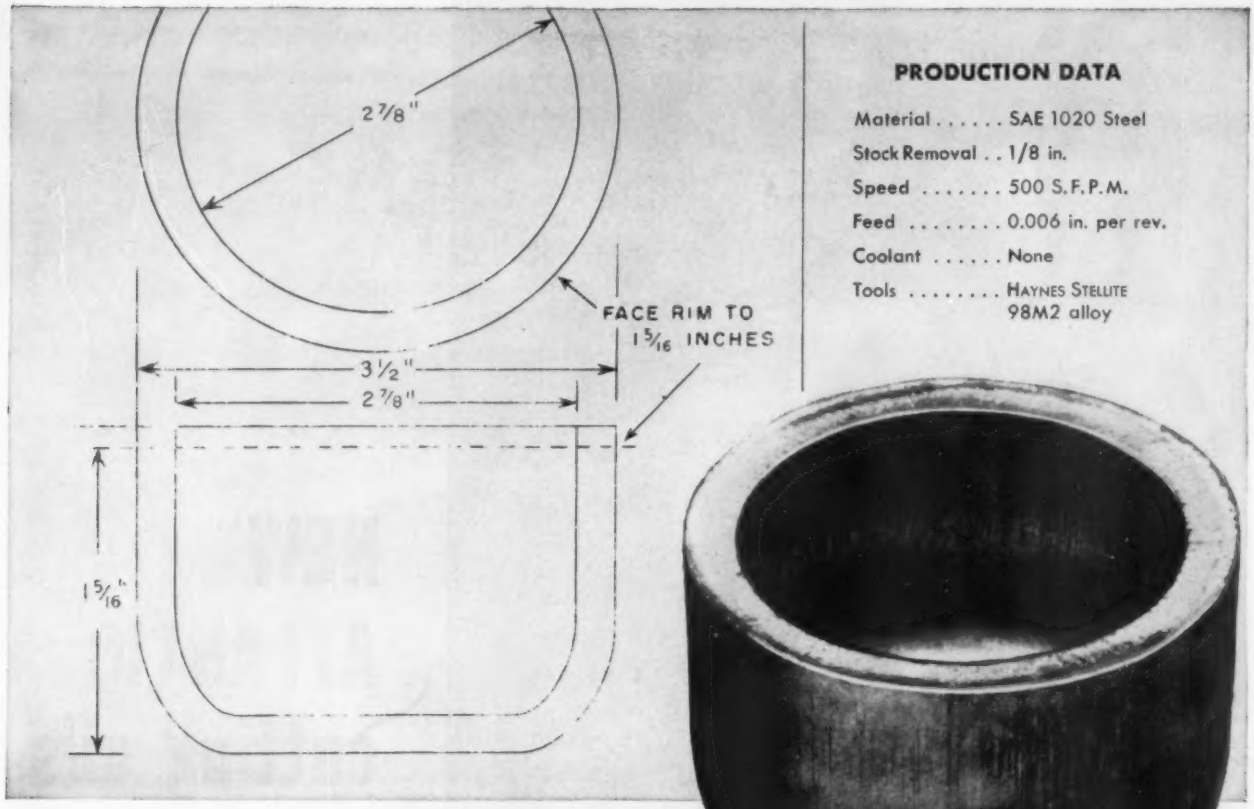

PRODUCTION DATA

Material . . . . . SAE 1020 Steel
Stock Removal . . 1/8 in.
Speed . . . . . 500 S.F.P.M.
Feed . . . . . 0.006 in. per rev.
Coolant . . . . . None
Tools . . . . . HAYNES STELLITE 98M2 alloy

1,000 PIECES ▸ MACHINED PER GRIND ...despite rough, uneven cut

HAYNES STELLITE 98M2 tools machine over a thousand of these torque converter cups between grinds. The cups are deep drawn from SAE 1020 steel, and are plunge cut. The area to be machined is rough and uneven. The HAYNES STELLITE tools operate for a full eight-hour shift, at a speed of 500 surface feet per minute, without chipping or spalling. No coolant is used.

HAYNES STELLITE tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. This same combination of properties makes them valuable on all machining jobs. They remove metal fast. They can be used at high speeds with comparatively high feed rates, and they can take deep cuts.

For information on how HAYNES STELLITE tools can help speed up your machining jobs, write for the booklet, "HAYNES STELLITE Metal-Cutting Tools." It gives helpful information on chip formation, tool design, and the machinability of metals.

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY
A Division of Union Carbide and Carbon Corporation
UCC
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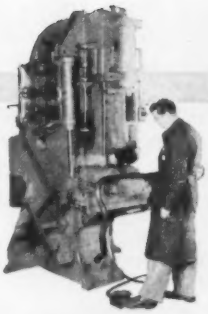
Sales Offices
Chicago · Cleveland · Detroit · Houston · Los Angeles · New York · San Francisco · Tulsa

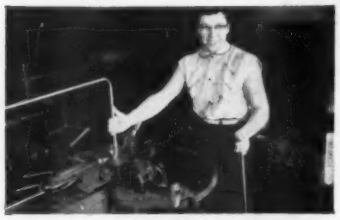
"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation

4 COST-CUTTING SOLUTIONS

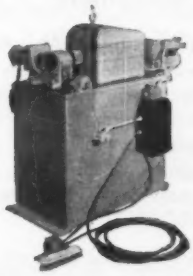
FOR FABRICATORS OF TUBING, PIPE, MOLDINGS AND EXTRUDED SHAPES



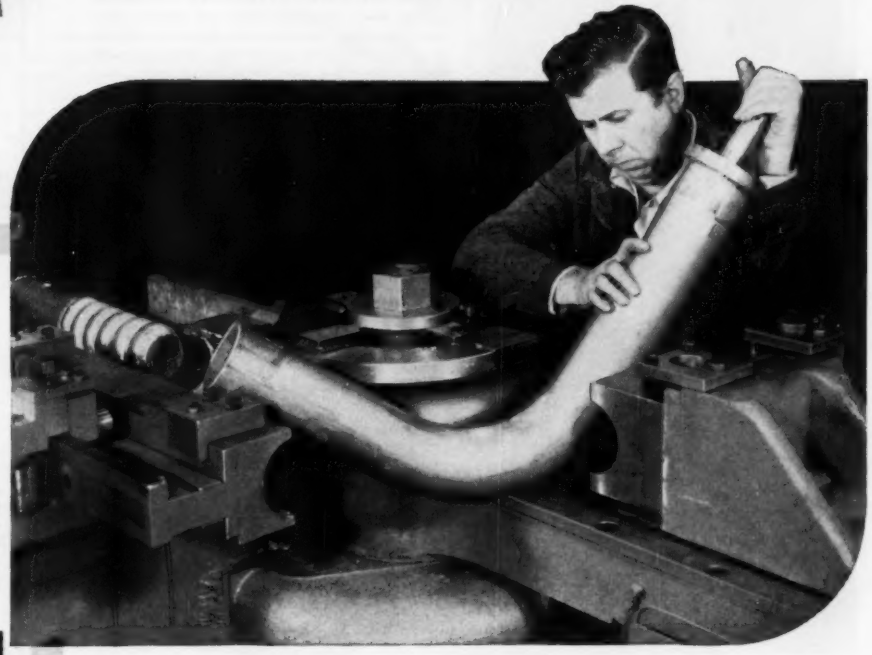
PINES 20-TON BENDING PRESS—Speeds production of automotive tail pipes, completes some jobs 50% faster by eliminating work handling. Up to 10 bends produced in a single progressive operation, most jobs completed in one handling.



PINES SEMI-AUTOMATIC BENDER—Capacity up to 300 bends per hour, for applications where output does not require speed of fully automatic machines. Hydraulic power assures accurate, highly uniform results. Economically tooled, easy for women to operate, requires up to 60% less floor space.



PINES END-FINISHING MACHINE—3" capacity, floor-mounted unit with air clamping. Speeds deburring, facing, pointing, or light hollow mill turning. Available with manual or air spindle advance. Other units also provided for smaller and larger work.

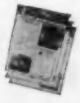


PINES SIZE 4 BENDER—Now cold forms ultra-thin 4" x .020" stainless steel tubes for aircraft to 8" c/l radius. Ability to form these sharp, small radius bends without wrinkles saved $14,000 per plane for an aircraft manufacturer.

● Since 1941, when Pines Automatic Hydraulic Bending Machines were first introduced, more and more plants fabricating tubing, pipe, rods, moldings, rolled and extruded shapes, have found it profitable to standardize on Pines Machines. Dependable accuracy, combined with fast, more efficient operation are two of the major reasons why hundreds of commercial and industrial plants have turned to Pines to find cost-cutting solutions to bending and end-finishing problems. A study of the four examples shown here may suggest how you may profitably take advantage of the latest developments in fabricating the "Pines-way".

WRITE FOR *Free* DATA SHEETS

For additional cost-cutting ideas, write today for free copies of "Pines News"—illustrates latest bending and end-finishing techniques applied to actual jobs. And call on Pines engineers for assistance on any job.



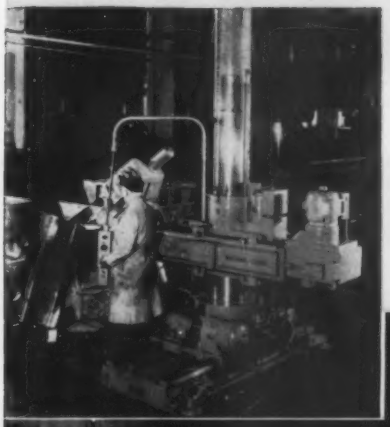
PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery 672 WALNUT • AURORA, ILLINOIS

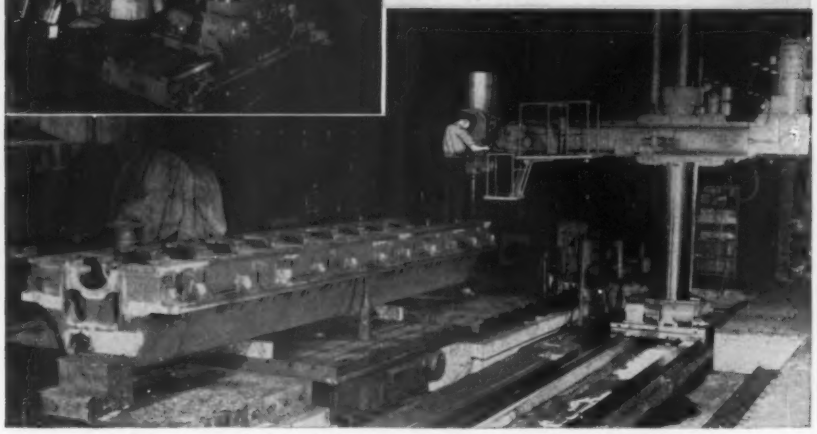
PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

Kaukauna At Work....

UNIVERSAL RADIAL DRILLING MACHINES



Drilling angular holes in bore of casting is a job that requires accuracy, fast tool positioning and plenty of power to take full advantage of the highest feeds and speeds permissible with modern cutting tools. Kaukauna Universal Radial Drills have the power, accuracy and stamina to do this work quickly, easily and at low cost. A versatile line of machines with simplified controls, they maintain efficient high production on large, unwieldly workpieces or small production parts, and perform drilling, reaming, boring, counterboring, tapping and spot-facing operations. They do jobs that no other machines can do . . . save time and money.



With extended column, runway and reach, this Kaukauna Universal Radial Drilling Machine is saving set-up time by drilling, tapping, driving studs and spot-facing with speed and accuracy from any angle on diesel engine bases and blocks.

Kaukauna builds Universal Radial Drills and Horizontal Drilling Machines in a range of sizes which meet practically all requirements in modern production practice. Write today for descriptive catalog or ask representative to call.

KMC Kaukauna MACHINE CORPORATION
KAUKAUNA, WISCONSIN, U. S. A.

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Special Machinery

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BEAUTIFUL HONOR ROLLS

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INCENTIVES — SERVICE AWARDS

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HERE'S YOUR CONSTANT INDEX TO MORE PROFITABLE PRODUCTION

This is just a reminder there's an easy way in which to get information in a hurry for solving those knotty production problems you're faced with daily.

Listed below is a general subject index to the answers you need, as you'll find them in your 1955 PRODUCTION PLANBOOK issue of *American Machinist*.

- **A** Management, Personnel
- **B** Machining
- **C** Tooling
- **D** Pressworking, Molding, Casting
- **E** Inspection, Testing, Quality Control
- **F** Assembly, Welding, Portable Tools
- **G** Heat-Treat, Cleaning, Finishing
- **H** Materials, Components
- **I** Materials Handling, Services
- **J** Prize Ideas, Rebuilt Equipment

And that's not all. An integral part of these ten sections are hundreds of informative advertisements . . . a list of manufacturers offering free product literature . . . and an alphabetic listing of products and services advertised in the PLANBOOK.

Information like this can help you find sure roads to faster, lower-cost production.

American Machinist
McGraw-Hill Building
New York 36, N. Y.

..checked for accuracy by ATOMIC LIGHT..

Swedish Johansson Gage Blocks are checked for accuracy by the latest scientific method, the atomic light, utilizing the lightwaves emitted from the Mercury isotope 198, now in use at the standard Bureaus throughout the world.

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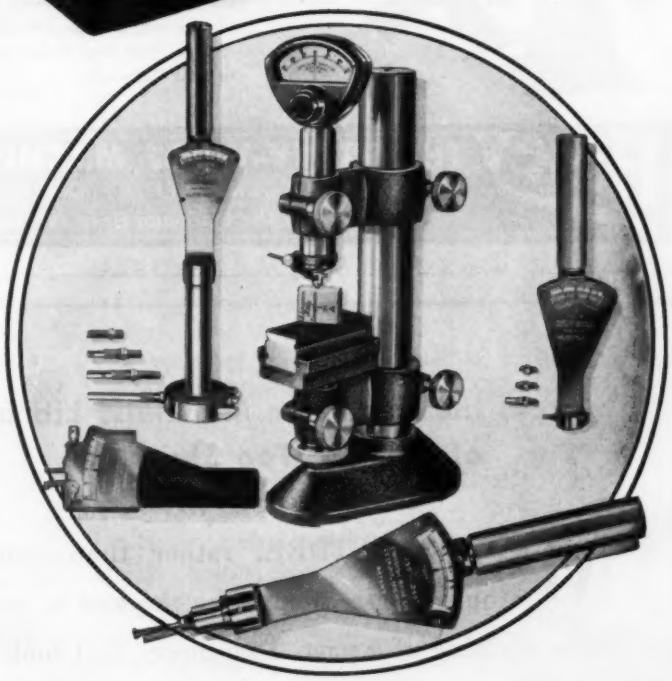
Assures You Precision to the Finest Degree to Meet Your Requirements —Backed by the Name Supreme in the World of Measurement.



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Short deliveries. Inspection and reconditioning service available at our plant.

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MIKROKATOR

(Amplifier—for outside measurements) Graduations .0001 to .000002 or .001 M to .0002 M.

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Micrometers, Snap Gages, Extensometers, Dynamometers, Hardness Testers, Surface Finish Indicators, Interferometers, Plugs, Rings and Special Gages.

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Are you having TROUBLES in your Drill Department?

Following are some of the most common and their causes:

Trouble	Cause
Oversize holes.	Unequal lip length.
Drill burns—will not cut.	Insufficient clearance.
Cutting edge chips or crumbles.	Too much clearance.
Outer corners of lip break down.	Speed too high.
Excessive wear on margins.	
Rough holes.	Speed too slow or
Drill breakage.	Feed too heavy
Drill point crushes.	
Broken tangs.	Dirt or chips in socket or worn out socket.

Most of the above can be overcome by using a precision type Drill Grinder. A Hisey Drill Grinder will quickly pay for itself when you consider that drills that are correctly ground and kept sharp will (1) drill faster, (2) drill more holes per grind, (3) drill to exact size, (4) reduce breakage, (5) increase life of drill by removing less metal when sharpening.

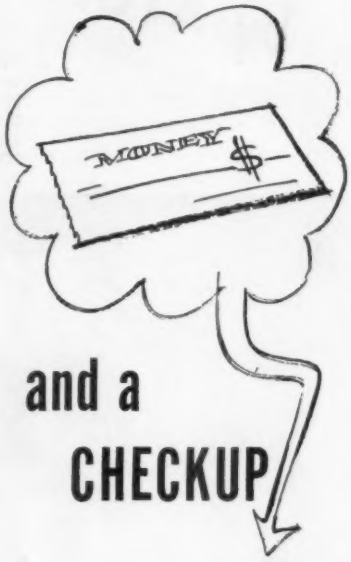
A Hisey Drill Grinder will grind drills quickly and correctly with inexperienced operators.

ASK FOR CATALOG 72 AY

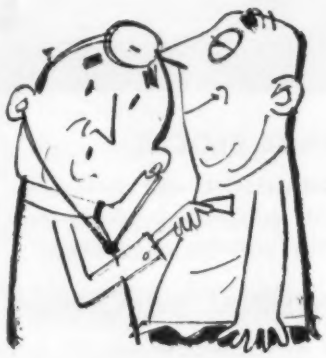
It shows more than 200 different types and sizes of Bench and Pedestal Grinders, Buffers and Polishers, Snagging Grinders, Lathe Type Grinders, Wet Tool Grinders, Disc Grinders and Dust Collectors.

Hisey THE HISEY-WOLF MACHINE CO.
CINCINNATI 8, OHIO
Division of The Cincinnati Electrical Tool Co.

fight cancer with a CHECK



and a CHECKUP

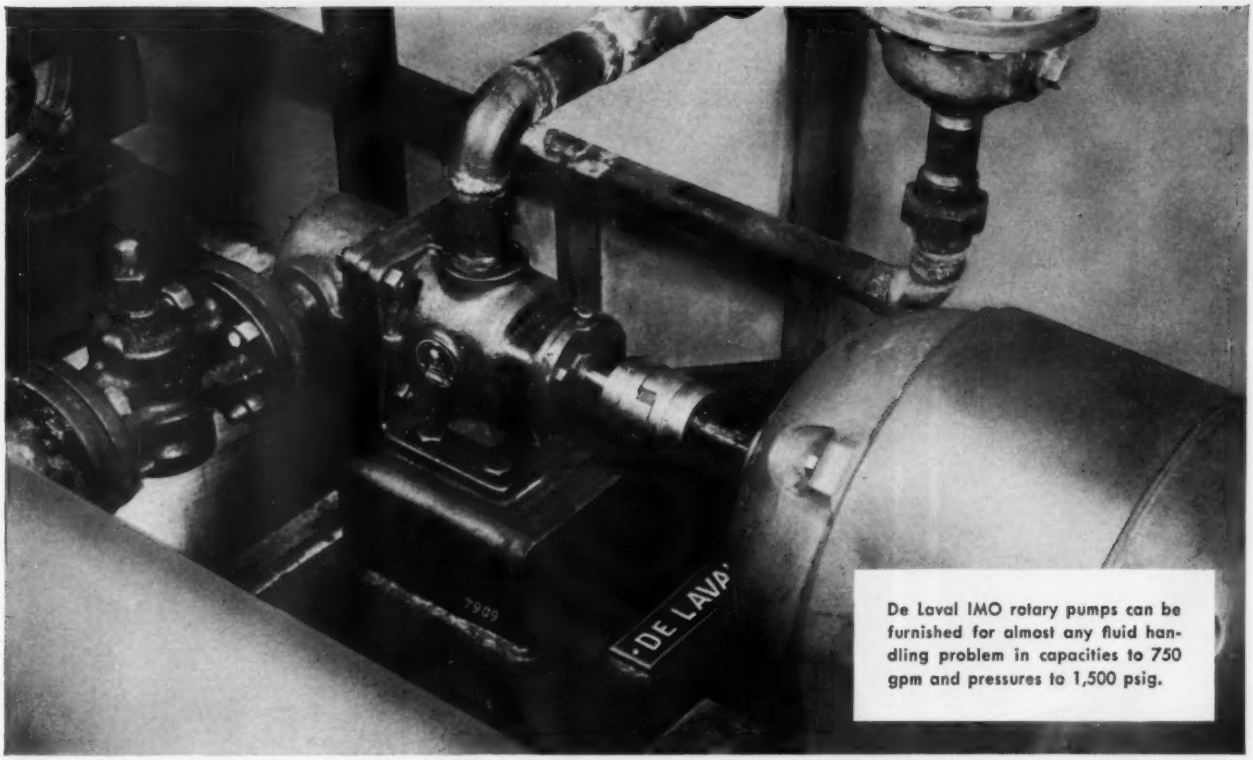


a check
to help others...
a checkup
to help yourself.

AMERICAN CANCER SOCIETY

From the *American Machinist* Library of *Tips for Top Shop Men*

MICROSTRUCTURE, rather than composition, may frequently be the key to successful machining of a part. Two pieces that look alike and were made alike may be entirely different in their reaction to a tool.



De Laval IMO rotary pumps can be furnished for almost any fluid handling problem in capacities to 750 gpm and pressures to 1,500 psig.

What to Look for in a Rotary Screw Type Pump

By W. J. Mongon, *Assistant Chief Engineer*
De Laval Steam Turbine Company

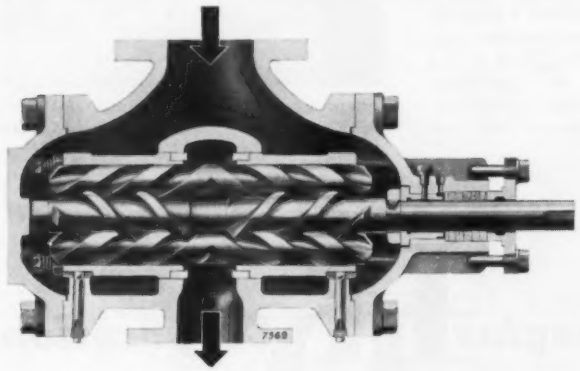
A sound knowledge of design, and how it affects performance, is the best insurance a buyer can have that he will get the pump he needs. This brief analysis of the IMO, a rotary three-screw pump manufactured by the De Laval Steam Turbine Company, will give you some of the necessary facts.

What qualities should you look for in a rotary type pump? It must, of course, meet specified capacities and pressures. But, it must also be efficient, operate quietly, stay on the job.

The axial flow of a screw type pump, and the resulting low inlet losses for any given pump speed, are important benefits that should be considered in making pump selections. The absence of timing gears and other mechanical features of construction also enable the De Laval IMO pump to operate at direct-connected motor and turbine speeds . . . to handle viscous liquids and high suction lifts.

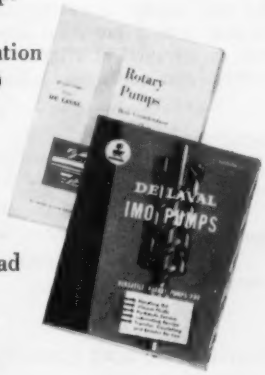
One of the most important features of the IMO pump is the hydraulic turning of the idler or sealing rotors. The central or power rotor is the pumping element; the liquid pumped turns the sealing rotors.

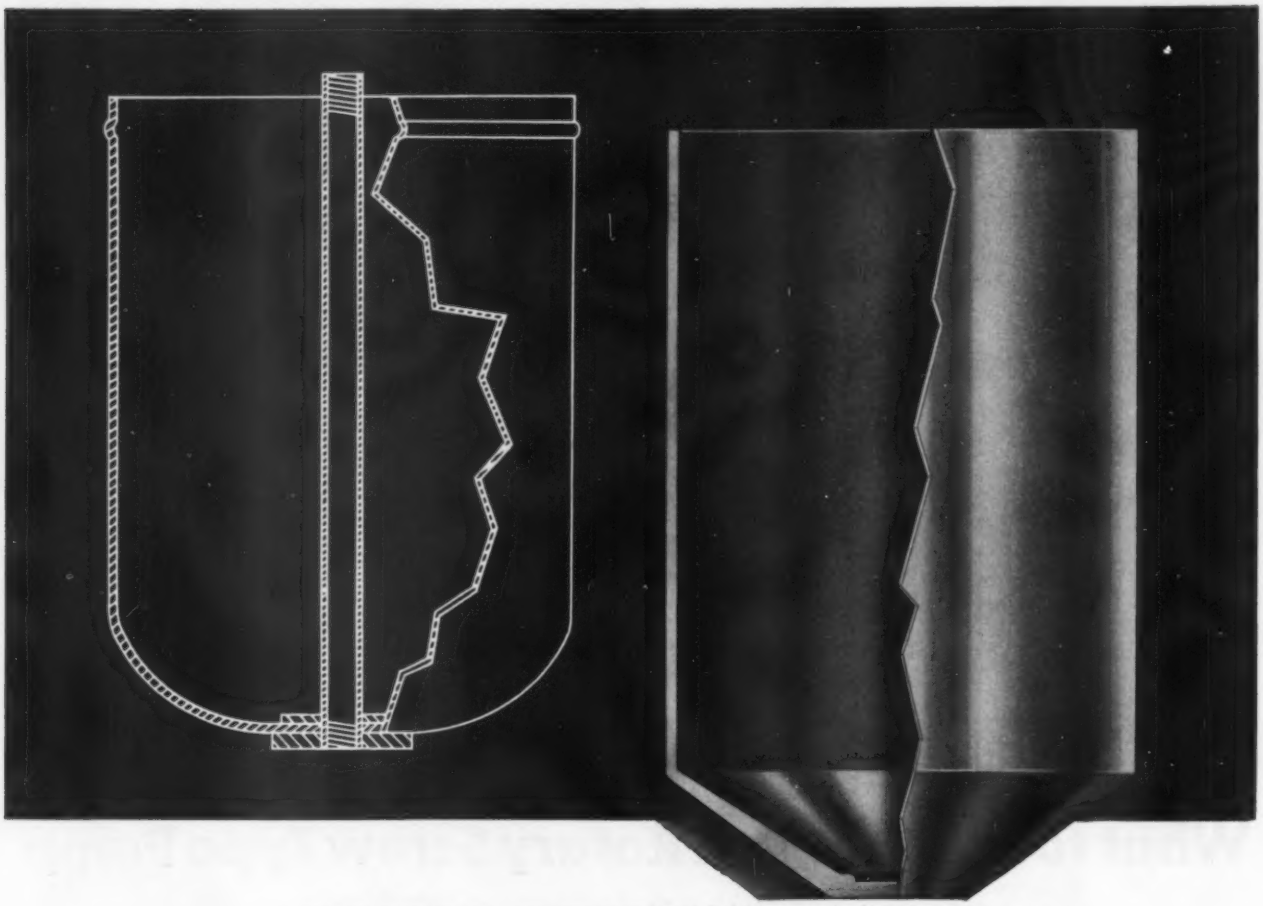
A screw type pump is well suited for applications where pulsation-free flow is desirable. The axial flow of the liquid without trapping and the unique thread form which keeps closures fluid-tight contribute to quiet operation of the IMO pump.



De Laval IMO Series A322A, a positive displacement, rotary screw type pump, can handle capacities to 750 gpm and pressures to 150 psig.

Catalog LS gives useful application and specification data on the IMO pump. An article titled, *Rotary Pumps, Basic Considerations in Their Application,* contains a description of rotary pumps in general. For these publications, write on your company letterhead to De Laval Steam Turbine Company, 887 Nottingham Way, Trenton 2, New Jersey. DL-301





SIMPLE DESIGN CHANGE AVOIDS 5-FIGURE TOOLING COST!

A typical example of product simplification with HUNTER DOUGLAS Cold Forgings.

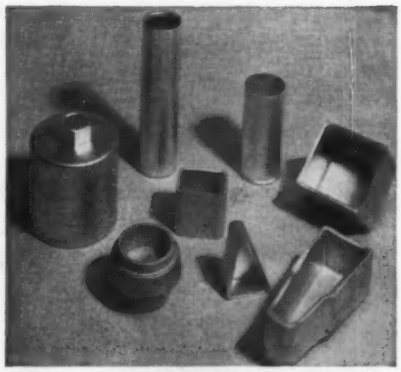
The above designs are typical of a common truck-type oil filter case. The first, illustrated in line, was conventionally produced utilizing a costly, 12 stage progressive die, and drawing from heavy gauge steel.

Figure 2 shows how a similar component can be cold-forged by Hunter Douglas. No expensive tooling is needed . . . in fact, savings in tooling alone would pay for the complete initial run. The component is completed in a single stage operation; punch and die are rugged, uncomplicated, totally free of the ordinary hazards of multi-stage die injury and breakdown.

A small trim around the can mouth is the *only* waste, since the component is formed from a pre-sized slug. Even this trim is salvaged at Hunter Douglas; remelted, cast and again rolled into plate, affording additional savings.

Strength and proof against leakage is doubly insured—by use of special aluminum alloys and by dense, non-porous grain structure having flow lines which follow the contour of the part.

Hunter Douglas Cold Forgings can be mass produced in any required numbers and to cover a tremendous range of design requirements. *For any shape requiring zero draft, for high physical properties, for hollow shapes with or without closed ends and for close dimensional tolerances* Hunter Douglas Cold Forgings may provide the answer. Before you invest in *any* form of tooling ask for an engineering analysis detailing possibilities of cold forging. A blueprint or sample part will provide necessary data.



These typical shapes illustrate the wide range of part geometry possible with Hunter Douglas Cold Forgings.

DESIGNERS:

If you want to know more about Hunter Douglas Cold Forgings write on your company letterhead for this free 40 page book, now on the press!

Hunter Douglas Corporation

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furnished in an attractive carrying case for proper care.

forms wheels to shape easy as A B C . . .

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- **Surface Grinders**
- **Tool and Cutter Grinders**

This is the only radii and angle Wheel Dresser that will accomplish the form dressing of 2 angles, 2 radii and one flat tangent in one setting. It comes in several models to form dress wheels ranging from the smallest sizes to those of 24" in diameter.

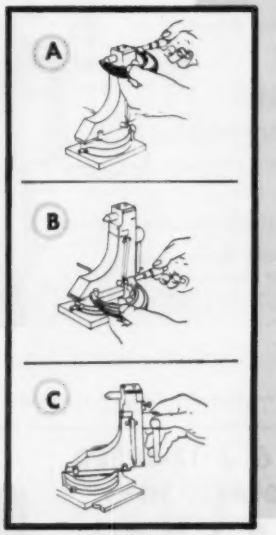
Fully adjustable, adaptable and semi-automatic in operation, the FLUIDMOTION Wheel Dresser is the only one requiring only a micrometer for setting to obtain any desired form.

Representatives in principal areas of the U.S.

A. Measure over diamond point to back of micrometer plate.

B. Add required convex radius or subtract required concave radius.

C. Tighten gib. Dresser ready for action.



J. & S. TOOL CO., Inc.

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Please send illustrated literature showing 6 models of Fluidmotion Wheel Dresser and one model of Form Master with full specifications, operating instructions and special examples of time and money saving applications.

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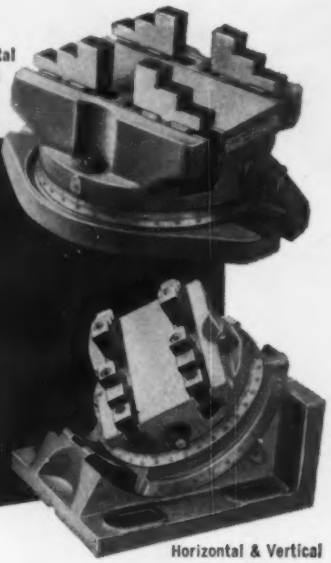

Horizontal Swivel Type

MULTI-PURPOSE WONDER GRIP VISES

4 STEPPED JAWS PERMIT CLAMPING of rough castings, irregularly shaped, round, and tapered pieces accurately and quickly, eliminating need for special jigs or fixtures. Narrow stepped jaws allow free access to and measuring of work pieces and provide clearance for cutting tools. Small work pieces machined on three sides without reclamping. Easy and quick to mount and align on any machine. Holds rigid in any position without vibration. Various capacities and extra soft jaws available.

Horizontal & Vertical Swivel Type

TAPPING ATTACHMENTS

Reversible safety tapping attachments with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout by long established reputable West German factory.

Tested for Performance to High Amer. Standards
Immediate Delivery from N.Y. Stock
MADE IN GERMANY
Low Competitive Prices

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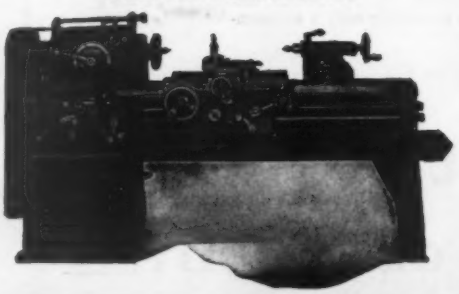
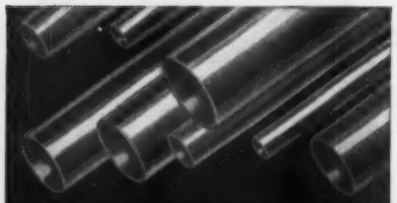
23⅜" carriage.



CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO



Now you can make WELDED TUBES at high speed from

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STAINLESS
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BRASS
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Within the last few years rapid strides have been made by Yoder in widening the scope and raising the speed of cold process electric-weld pipe and tube making. In a new line of tube mills perfected by Yoder, many nonferrous metals can be induction-welded in gauges up to .154" and at speeds approaching those attained in resistance-welding steel tubes.

Further, speeds up to 250 fpm are reached in induction-welding *steel* tubing in the same gauges.

New compact Yoder "4-in-1" Welding Transformer is the last word in resistance-welding steel pipe and tubing in sizes up to 24" diameter.

More specific information, literature and estimates on request, without obligation on your part.

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Electric Weld
TUBE MILLS

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KENNAMETAL* GRADE
K21

the new, superior General Purpose steel-cutting carbide

K21 . . . the new Kennametal General Purpose steel-cutting grade . . . is out-performing all other carbides in its field, even K2S, the leader of all General Purpose grades in the carbide industry for over a decade. Its superior performance is due to high edge strength, combined with superior wear qualities and resistance to cratering. K21 was created to help get highest productivity from today's high-speed machines, yet, due to its range, it does an excellent job on older, slower-speed machines.

Naturally, K21 has been thoroughly tested. It has demonstrated great versatility on planing, turning, boring, plunging, and interrupted cutting . . . on such materials as forgings, sandy castings, centrifugal castings, plate, bar stock, and weldments.

K21 simplifies the problem of grade selection since it performs in all three groups—general steel-cutting, heavy roughing, and finishing. It is ideal for machining the newer high tensile strength steels, has high resistance to thermal shock, and is less susceptible to grinding cracks.

Why not try Kennametal Grade K21 *now!* It is available from stock in the most popular blanks, tools and inserts. Order today. KENNAMETAL INC., Latrobe, Pennsylvania.

K21 OFFERS

- Superior Wear Qualities
- Exceptionally High Edge Strength
- High Resistance to Thermal Shock

K21 is designed for cutting stainless steels, nickel steels, heat-resistant alloys, and high tensile alloy steels.

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5580

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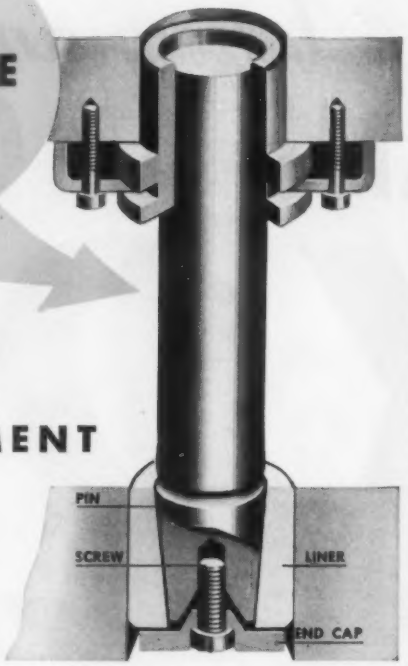

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... and still maintain
PERFECT ALIGNMENT

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Now, to sharpen the die or make design changes, you simply remove the screw and end cap, then take out the pin—without damaging the die shoe. You can replace Lamina pins in any hole, in any position. Self-locking, matching tapers on the pin and hardened bushing liner plus perfect concentricity between the taper and the pin bearing surface assure an exact fit and precision alignment every time.

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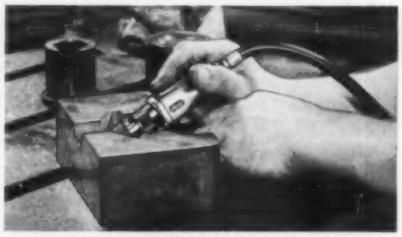

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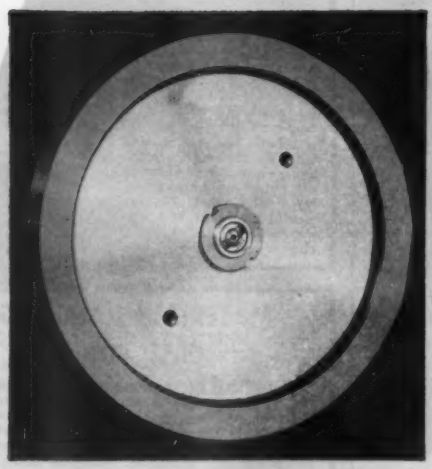
MU-166

From the *American Machinist* Library of *Tips for Top Shop Men*

THE old Army slogan, "If it moves, salute it; if it doesn't, pick it up; if you can't pick it up, paint it," can well be adapted for plant use by changing "salute" to "guard" and "paint" to "oil."



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300% less tools required per job
400% savings in monthly tool cost

the superiority of ELOX electrical discharge grinding was proved by this large automotive company's unsolicited 2-month comparison report!**

Tool Name, Description:	Solid Carbide Insert	
Part Name:	Crankshaft	
Operation Name:	Finish Front & Rear Thrust Bearings	
	Standard Grind	Elox EDM Grind
TOTAL PIECES PER TOOL	17,290	95,904
MINUTES PER GRIND	21.0	13.75
COST PER GRIND	$ 1.26	$ .83
ESTIMATED MONTHLY TOOL COST	$294.71	$92.19

in writing **Elox will guarantee increased tool productivity over any type of abrasive grinding.**

Other Elox equipment available to remove broken taps, drills, etc., from $495 to $3450.

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**Comprehensive report and company name given on request.
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ARE you lugging materials to and from a machine for a minor operation that should be done where the material is? Check facing to length, centering, cut off, plain grinding. If volume is large, it may be cheaper to move the machine once and for all rather than moving the material continuously.

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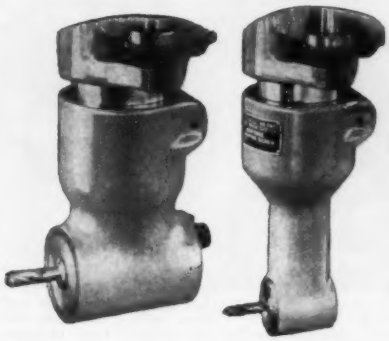
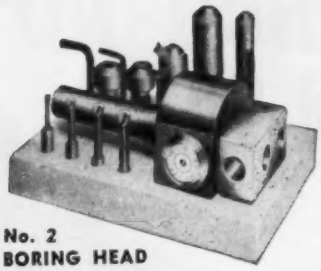


(Left) Heavy Duty . . . for milling and drilling at right angles; fits both Master and 1 HP Bridgeport Heads. (Right) Light Duty . . . for right angle milling and drilling narrow, deep molds and cavities.



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Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.

MILLING MACHINE VISE

Improved and providing great gripping power, with large diameter screw for rigid holding. Streamlined for appearance and equipped with coolant trough. Two sizes: 5"x3½" and 6"x5" jaw openings.

A few of the Attachments available

Bridgeport

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"Bridgeport Millers" in themselves are universally recognized as machines of outstanding utility. Their exclusive *method* of being able to drill, mill, bore and shape over a wide area without changing set up, has contributed much to their universal acceptance through the convenience, economy and accuracy offered. But this is not the whole story . . .

Note the attachments shown above. Here are a few means developed by "Bridgeport" engineers to go still further in extending the versatility of these machines . . . attachments which mean not only greater convenience but which vastly extend the operations which can be performed . . . attachments which will enable one machine to do the work of *several* single purpose machines. Furthermore, many more jobs can be assigned to the "Bridgeport" with the result that many more productive hours are available from one machine.

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Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

PUNCH-NOTCH and SAVE-

TOOLSET
HOLE PUNCHING and NOTCHING UNITS

Savings multiply—and fast! when you adapt Toolset Hole Punching and Notching Units to your operations now employing conventional die sets.

The reason? Toolset Units whack away at costs not one, not two, not three, but FOUR ways:

- Low initial cost
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- Eliminate costly fixed die sets
- Tooling reusable setup after setup

. . . these cumulative savings result in a substantial lowering of per piece part cost. And, in most cases, Toolset Units permit you to render faster service . . . a bonus feature in better customer relations.

Toolset Hole Punching and Notching Units are available in seven widths from ¾" to 3½"; throat depths from 4" to 16". Punches available in round, square, rectangular, obround or special shapes as required.

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Start cutting costs NOW — Send coupon for Catalog of complete Toolset Line.

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Gentlemen:
Please furnish a copy of your Catalog on Hole Punching and Notching Units.

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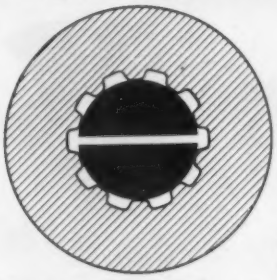
Gages MINOR DIA. of SPLINES
easily, accurately to fractions of .0001"



Because it is a UNIQUE expanding plug gage, Comtorplug easily gages inside splines that are difficult for other contact types of gages.

COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from ⅛" to 8" dia.

UNIQUE ADVANTAGES

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- Gages work while still held in chuck.
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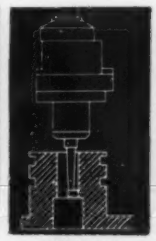
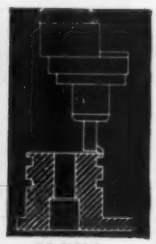
GET THE FACTS—REQUEST BULLETIN 48

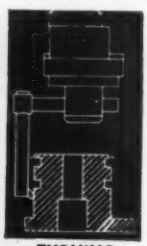
A Boring Head That Won't Face is NOT Complete



BORING



FACING



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CHANDLER-DUPLEX Does ALL IN SET-UP

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TURNING
GROOVING
UNDER-CUTTING

CHANDLER-DUPLEX *combines* boring and facing — permits all these operations in one set-up. Built for efficiency, accuracy and stamina.

A Model for Any Size Machine

Write today for full details and Catalog on this combined Boring and Facing Toolhead

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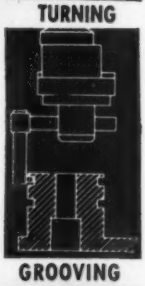
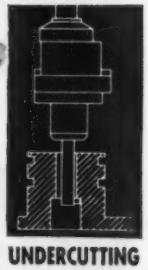
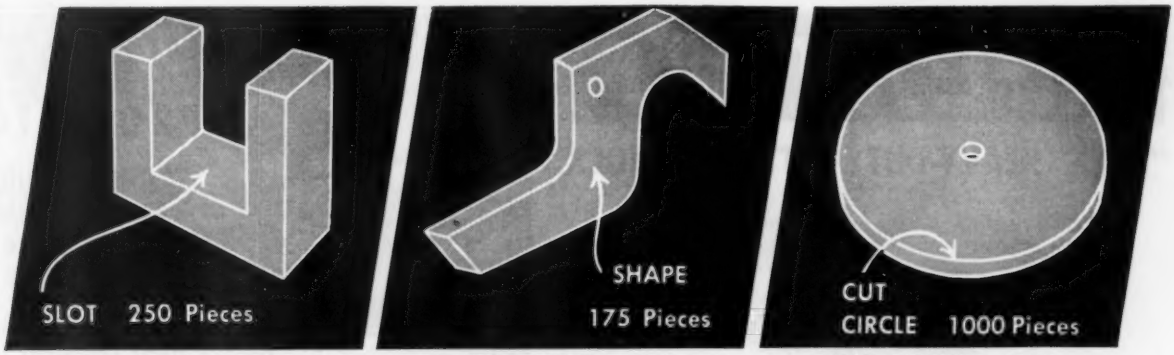


GROOVING



UNDERCUTTING

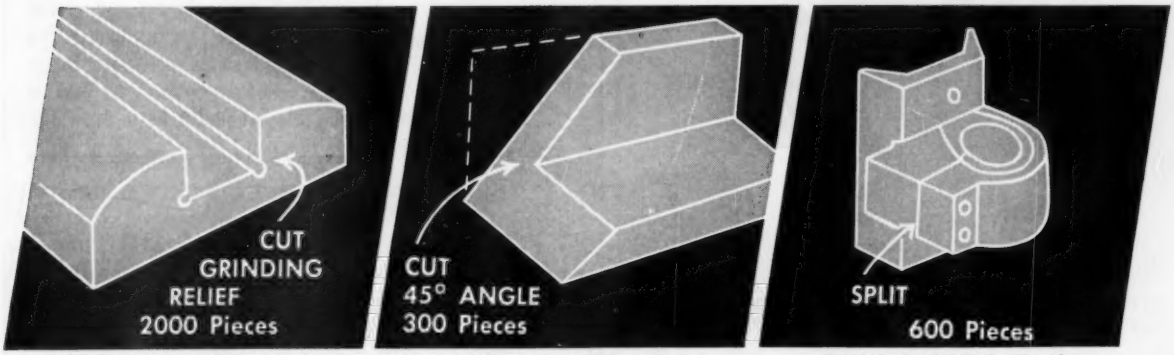
COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex



TIME SAVING 58% by replacing milling with band machining.

TIME SAVING 19% with band machining over torch cutting.

TIME SAVING 47% by changing from turning to band machining.



TIME SAVING 56% with band machining versus milling.

TIME SAVING 62% by changing from power hack saw to band machine.

TIME SAVING 71% with band machining over vertical milling.

To Cut Costs... Get the Facts about DoALL'S New Machining Concept

TO CUT your production machining costs simply analyze each operation to determine those that can be performed on new DoALL power-feed band machines. A DoALL man will help you—show you how to save up to 50% or more on jobs now being handled on slower, more costly machine tools.

Here are some of the reasons: new DoALL Contour-matic band machines have hydraulic power feed, integral coolant system, more power, greater rigidity. New "Demon" *high speed steel* band tools cut up to 6 times faster, last up to 10 times longer than any previous saw bands.

The "non-restricted geometry" of band machining—cut any angle, any direction, any radius—assures great versatility.

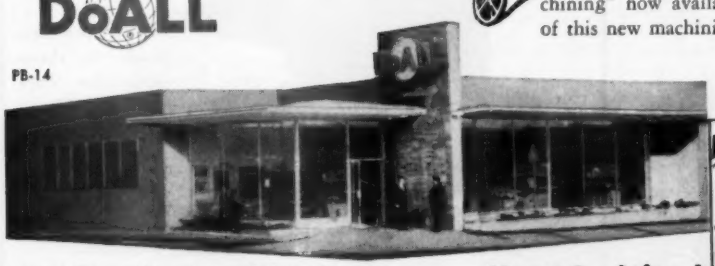
Add it up—faster cutting, lower tool cost, simple fixturing, lower capital investment, greater usefulness —then ask for a free demonstration. Call your local DoALL Store (see classified directory) or write *The DoALL Company, Des Plaines, Ill.*

DoALL

PB-14

NEW COLOR FILM—"Production Band Machining" now available showing operation of this new machining concept.

EDUCATIONAL STUDY WALL CHARTS
Economic Principles
$1.00 each postpaid
Lower quantity prices.



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"APEX" manufactures inserted tools and milling cutters of all styles. Carbide-tipped cutters furnished when required.

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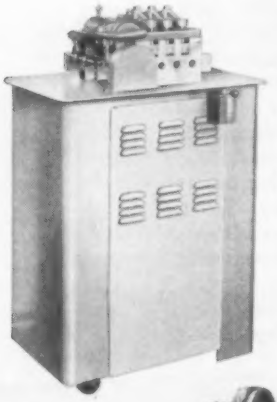
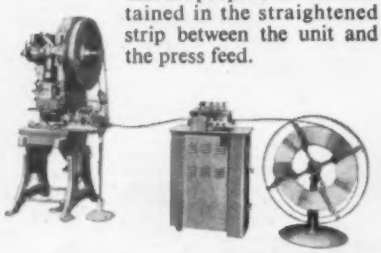
Economy · Dependability

WITTEK

STOCK STRAIGHTENERS



Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes —Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

5577

Write for full particulars

WITTEK Manufacturing Co.

4320 W. 24th Place · Chicago 23, Illinois

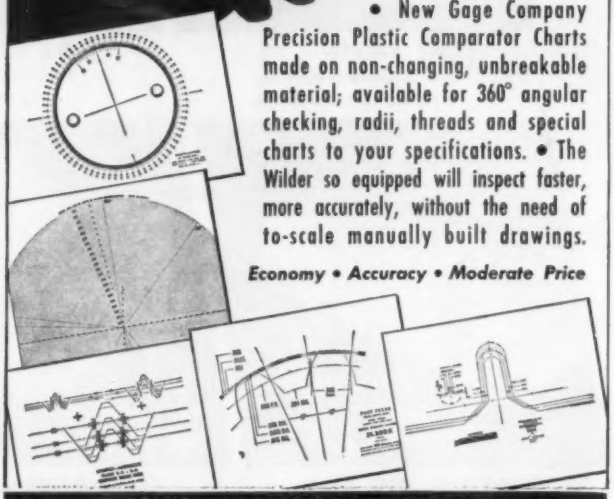
Production Feeding Equipment

WILDER PROJECTOR

The MICRO-PROJECTOR with the VERTICAL DESIGN

• New Gage Company Precision Plastic Comparator Charts made on non-changing, unbreakable material; available for 360° angular checking, radii, threads and special charts to your specifications. • The Wilder so equipped will inspect faster, more accurately, without the need of to-scale manually built drawings.

Economy • Accuracy • Moderate Price



Geo. SCHERR OPTICAL TOOLS, Inc.

200 A.M. LAFAYETTE STREET • NEW YORK 12, N. Y.

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

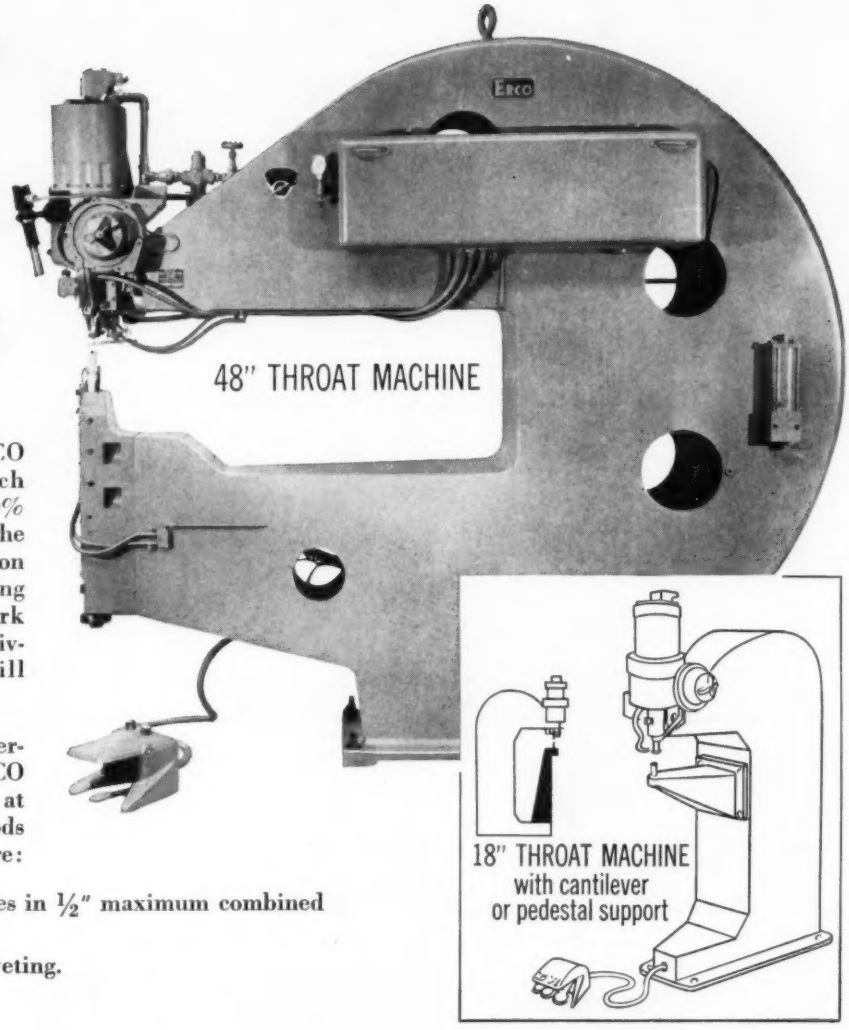
DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER, N. Y.

ERCO AUTOMATIC DRILL RIVETERS

handle heavier materials faster...

at lower cost!



Like the well known ERCO Automatic Punch Riveters which boost production as much as 400% and cut labor costs up to 80%, the *Drill Riveters* offer great savings on riveting jobs that are beyond punching range thickness. Air gapped work combinations unsuited to punch riveting are easily handled by drill riveting.

Because they combine four operations in one continuous cycle, ERCO Automatic Drill Riveters perform at rates far surpassing other methods now in use. These operations are:

1. Drilling up to ¼" diameter holes in ½" maximum combined material thickness.
2. Drill countersinking for flush riveting.
3. Automatically feeding rivet.
4. Heading rivet.

VERSATILITY . . . another plus!

Flush riveting solid rivet in solid work

Plain riveting solid rivet in solid work

Plain riveting tubular rivet in work with air gap

These machines can handle all types of solid or tubular rivets from 3/32" to 1/4" diameter, for drill riveting in aluminum, copper, brass, steel, plastic, fiber and wood. If you have a special fastening problem, ERCO's experienced staff will analyze it and adapt a machine to it.

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PROFILE-TRACING LATHE ATTACHMENT

Proven in 101 practical shop and production applications!

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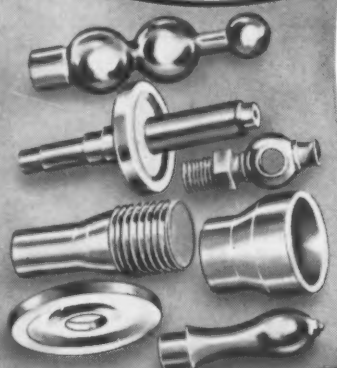
DUPLICATING
With any LATHE, PLANER, BULLARD — with any type of tool



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LOW COST *Heavy Duty Tool*

Cuts duplicating time from hours to minutes. No complicated Hydraulic or Electronic controls. Requires no permanent lathe alterations. Uses easily made, low cost templates. Unlimited radii, threading, steps, facing, grinding, boring—on any metal. Models to fit lathes of all sizes.

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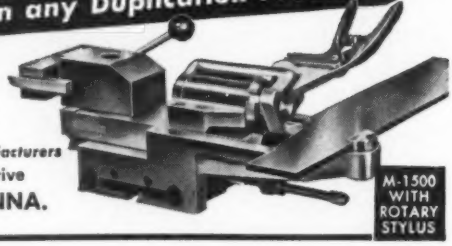


Air Control Division
Lehigh INC.
Factory Trained Representatives at your service in all principal areas.
Engineers and Manufacturers
1501 Lehigh Drive
EASTON, PENNA.

WHAT'S HAPPENED TO WAGES AND PRICES IN METALWORKING?

A comparison of '54 and '53 average wages and prices, plus the percentage of change, is listed for all major manufacturing groups of this industry in your 1955 PRODUCTION PLANBOOK issue of *American Machinist*.

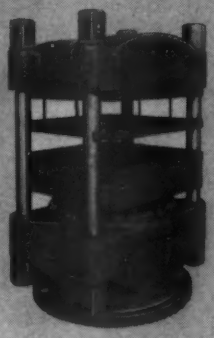
Many other facts and figures in the PRODUCTION PLANBOOK's *economic report* can help you judge the amount of business you can expect this year . . . how much your payroll may rise or dip . . . give you many more clues to your firm's probable profit picture.

Even more valuable to you are the 1955 PRODUCTION PLANBOOK'S more than 2,000 production "nuggets" and the data-crammed special report on *How to Work Steel*.

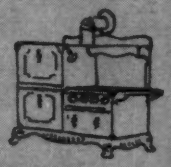
American Machinist
McGraw-Hill Building
New York 36, N. Y.

In the good old days

When the "Silver Campaign Depression" made it difficult to feed our horse, let alone meet the company payroll



when kitchen stoves were cast iron — and we made stove plate castings . . . when our first ads appeared in such well known magazines as:



HORSELESS AGE
AMERICAN MANUFACTURING
MODERN MACHINERY
THE GAS ENGINEER BULLETIN

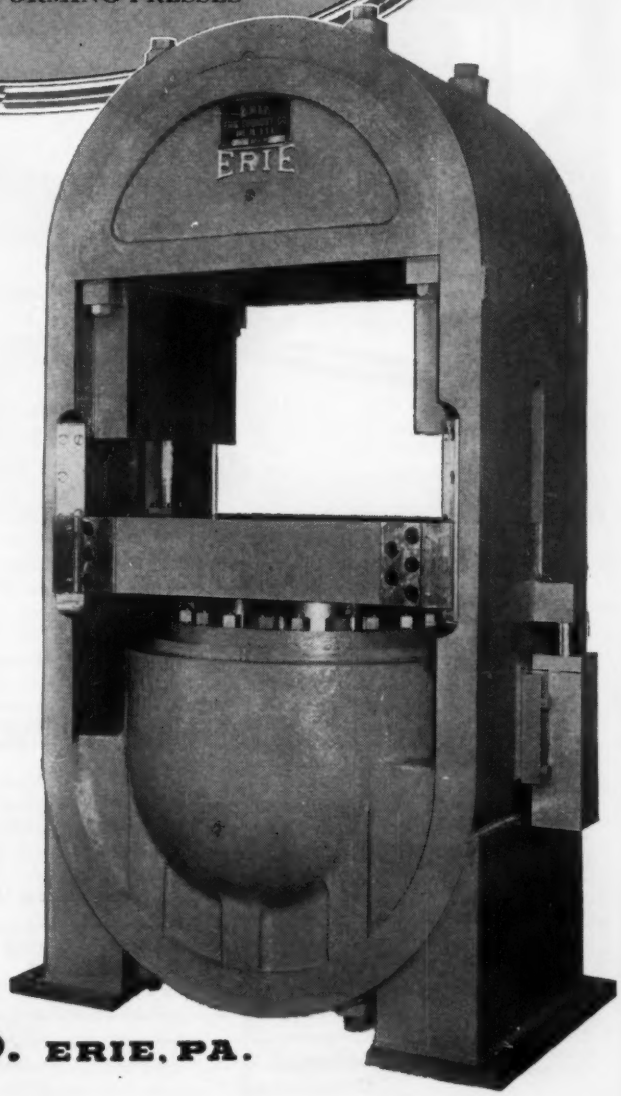
ERIE FOUNDRY WAS A GREAT NAME IN SPECIAL METAL-FORMING PRESSES

in today's modern metal working shop

When high labor costs mean more production per machine per hour to make a profit . . .

When exerting tremendous forces means faster shaping of metals . . .

When minimum deflection (less than .002") means almost perfect die matching . . . almost perfect parts . . .



ERIE

is still the greatest name in special hydraulic metal-forming presses

ERIE FOUNDRY CO. ERIE, PA.

From the *American Machinist* Library of *Tips for Top Shop Men*

SPECIAL jobs take special doing. They're the most profitable places to try special tools, special coolants, special operators. Too often the tendency is to be content with any method that will do the job at all.

Here is a completely new electric-hydraulic forcing and straightening press, with construction and operating advantages never before offered in a low-cost shop press.

These are a few of the features:

- **Rapid Ram Approach** — Automatically changes to power stroke when it contacts the work.
- **Movable Workhead** — Self-contained—easy to center over the work. Workhead can be purchased separately.
- **Variable Ram Speed** — From zero to maximum under fingertip control.
- **Modern Design** — All operating controls at convenient working height.

These and dozens of other features are fully described and illustrated in new Bulletin No. 347, which we will send promptly on request. Send the coupon today.

DAKE PRESSES

DAKE CORPORATION
636 Seventh Street, Grand Haven, Mich.
Please send Bulletin No. 347
Name_____
Company_____
Address_____
City_____ Zone____ State_____

How to Control SHOP COSTS

Skillful control of all operations involved in developing, manufacturing, and marketing the products of your company bears strongly on your company's profit situation.

This *American Machinist* Special Report describes methods of controlling manufacturing costs that can be applied in jobbing as well as production shops. Basic concepts of common costing methods are examined, and emphasis is given the fundamentals upon which all systems must be based to produce accurate operating figures.

Numerous graphs, charts, and reproductions of the many operating reports required add to the helpfulness of this fifteen-page report by Albert E. Grover, Cost Consultant.

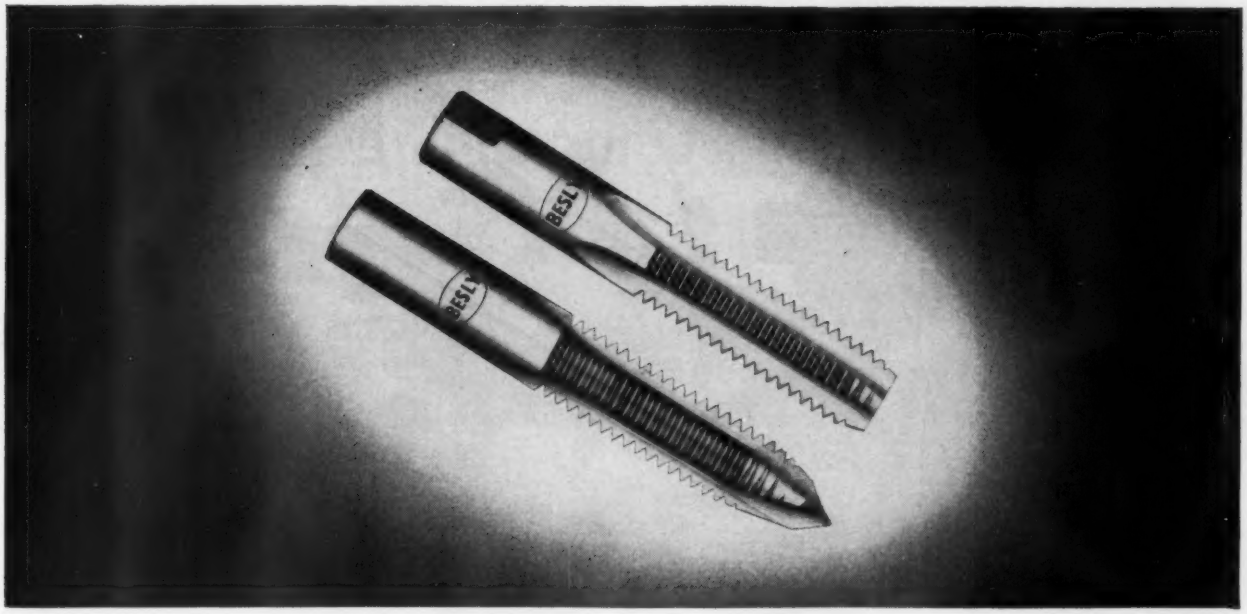
25 cents a copy

Reader Service Department

American Machinist

McGraw-Hill Building

New York 36, N.Y.



New Besly Stub Tap for Screw Machines

SAVES SET-UP TIME • FITS STANDARD BUSHINGS • HAS STRONGER SHANK

Available at No Extra Cost from BESLY

A new, shorter length tap that need not be altered before use in screw machines has just been made available as a standard item by Besly-Welles Corporation. Developed in cooperation with the National Screw Machine Products Association, the new tap conforms to standards recently drawn up by that group.

SHORTER SHANK, SHORTER THREADED PORTION

The shank (and threaded portions in larger sizes) of the new Stub Tap have been shortened to enable it to fit into the space between the spindle nose and tool holder of screw machines. In the past, it has been necessary for users to cut off part of the shank and even part of the threaded portion of standard hand taps to fit them into screw machines . . . or order higher priced "specials." Now, screw machine operators can save set-up time by using the new Stub Tap just as it comes in the package.

SIMPLIFIES BUSHING INVENTORY

The shank of a Stub Tap is the same size as its nominal O.D. This permits standard sized bushings to be used and reduces bushing inventory problems. The full diameter shank provides greater strength than standard hand taps which have shanks usually turned down in the larger sizes.

FACTORY-PERFECT ACCURACY

The shank of the Stub Tap is made concentric with the threaded portion, assuring accurate alignment in the tool holder. Since it is not necessary to cut off the forward threaded portion of a Stub Tap, chamfer and back taper are maintained factory-perfect. Squares, except for two small driver flats at the end of the Stub Tap, are eliminated. This permits better holding power, better alignment and longer accuracy.

FAST DELIVERY FROM STOCK

Complete stocks of the new Stub Tap will be on hand at Besly distributors by June 1. Users will be able to get the same fast delivery on Stub Taps as they have on other Besly standard taps.

AVAILABLE IN SIZES THROUGH 1-IN.

The new Stub Tap is made in fractional sizes from ¼-in. through 1-in. and in machine screw sizes from #0 through #14. A bulletin describing the new Stub Tap and giving the standards applicable to it is available at no cost or obligation. See your Besly distributor or write or call:

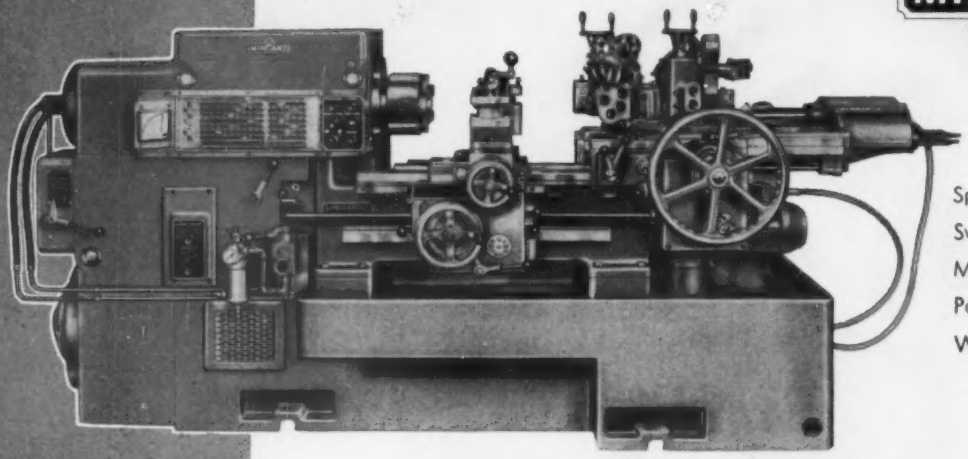
BESLY-WELLES CORPORATION
120 DEARBORN AVE., BELOIT, WISCONSIN
Telephone: DUnkirk 9-2231
In Chicago: 184 North Wacker Drive
Telephone: FRanklin 2-1222
In Cleveland: 1474 Lakeside Avenue
Telephone: PRospect 1-6250
In Detroit: 16509 Meyers Road
Telephone: UNiversity 3-4805

BESLY HAS THE COMPLETE LINE

Order all of your cutting tool needs for your screw machines from your Besly distributor—your quality source for a complete line that means long life, accurate cutting and lower tool costs.

50/E

MINGANTI
BOLOGNA



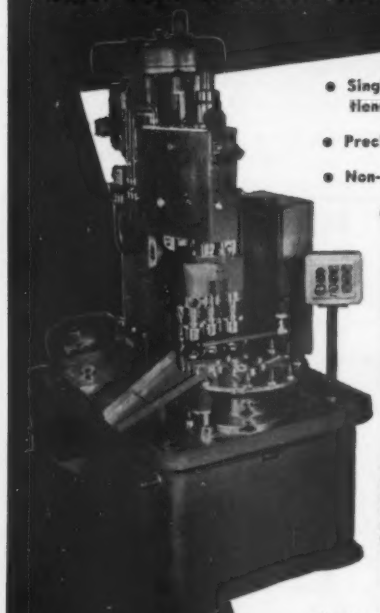
Spindle bore	2 1/4"
Swing	18"
Max speed	rpm 3000
Power	HP 8
Weight	lbs. 6000

AUTOMATIC
"CAMLESS"
TURRET LATHE

GIUSEPPE MINGANTI & C.
BOLOGNA (Italy)

For information apply to:
American Ligurian Co. Inc. 37 Wall Street – New York 5 - N.Y.

KAUFMAN
TAPPING MACHINES
BUILT FOR SPECIFIC PRODUCTION JOBS



- Single or Multiple Operations
- Precision Depth Control
- Non-reversing Motor Drives
- Pressure Lubricated Lead Screws
- Fast, Accurate Rugged Index
- Other Head Units Available
- And Many Other, Worthwhile Features

Send prints and sample of your work for further information and recommendations on how Kaufman Tapping Machines can reduce your production costs.

Catalogs Number 754 and 1153

The Model 75-24 MAILED ON REQUEST Kaufman Tapper

KAUFMAN

KAUFMAN MANUFACTURING CO.
343 So. 29th St., Manitowoc, Wisc.

CUTTING ECONOMY

MODEL
RC 250

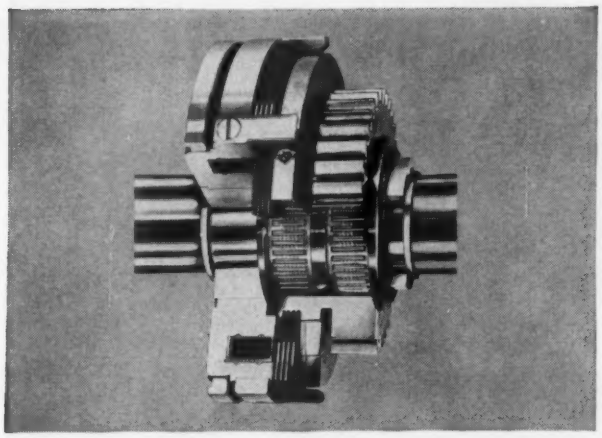
SAJO
HYDRAULIC HACKSAW represents the latest addition to the SAJO line of Hacksaws built by Sweden's largest Hacksaw manufacturer. This Heavy Duty 10" x 10" Production Hacksaw incorporates the unique feature developed by SAJO providing instantaneous finger-tip controlled cutting pressure insuring maximum cutting efficiency and saw blade life. Designed for simple fool proof operation and incorporating the sturdy construction and painstaking workmanship on which the SAJO reputation has been earned, the Model RC 250 represents an outstanding value in this type of metalworking equipment. Also available are, SAJO Utility Hacksaws; Model RC 30 6" x 6" and Model RC 45 9" x 9".

Prompt delivery – Attractive Price – Write for Folder!

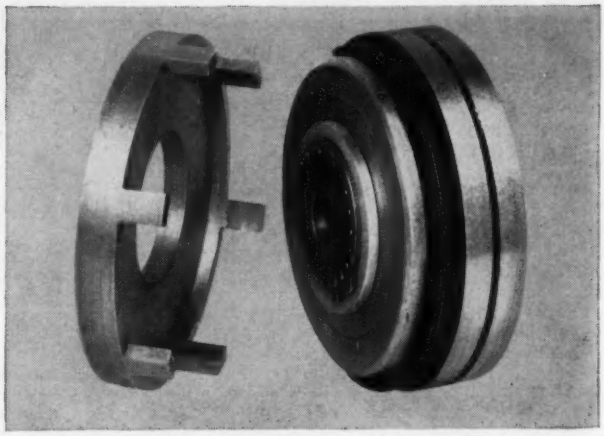
austin industrial corp.
76-F MAMARONECK AVE., WHITE PLAINS, N. Y.
Dealers in principal cities
Look for the Austin Seal – your full guarantee of satisfaction!

I-T-E ELECTRO CLUTCH—unit assemblies now available in American Standard dimensions

Two different designs—slip them right on your present shafts



1. Low inertia "H" design. Most of weight concentrated in center. Both drive and driven shafts are splined to key with clutch body and laminations respectively.



2. External drive "C" design. Magnet body serves as power take-off by means of flanged coupling or integral gear. Splined shaft is continuous through clutch center.

Here's good news for machine designers. Now you can order I-T-E Electro Clutches in unit assembly designs. Simply specify the clutch sizes you need, and the shaft dimensions taken from your own drawings.

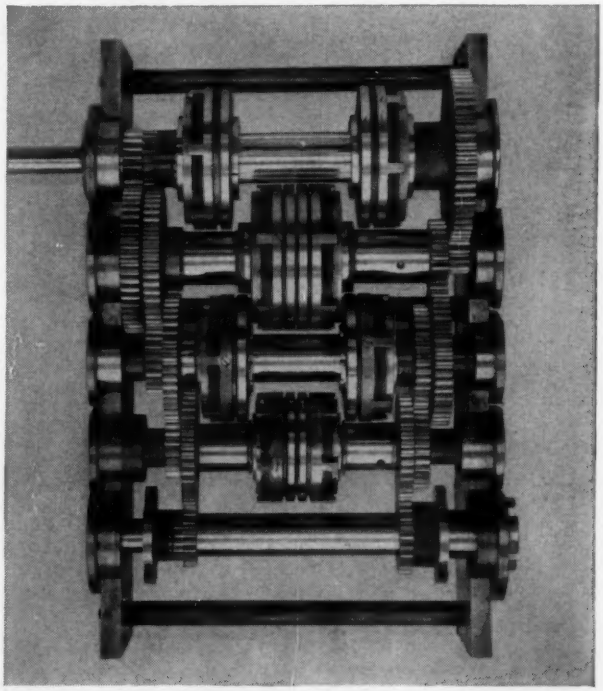
WHY I-T-E ELECTRO CLUTCHES?

Of highest torque rating for their size, compact I-T-E Electro Clutches fit right into the transmission box and operate under oily conditions. 24 volt supply is safe, operates with inexpensive telephone type relays. No friction linings to replace. In fact the clutching surfaces need *no maintenance of any kind.* They are self-adjusting—no change in torque rating during life of clutch.

SOLVES SKILLED OPERATOR SHORTAGE

Machines equipped with I-T-E Electro Clutches can produce more because feed and speed changes can be made instantly just by turning knobs or pushing buttons. With automatic programming, optimum production speeds can be predetermined and preset. Tamperproof cover prevents unauthorized changes.

Write for illustrated bulletin. I-T-E Circuit Breaker Company, Transformer and Rectifier Division, 19th & Hamilton Sts., Phila. 30, Pa.



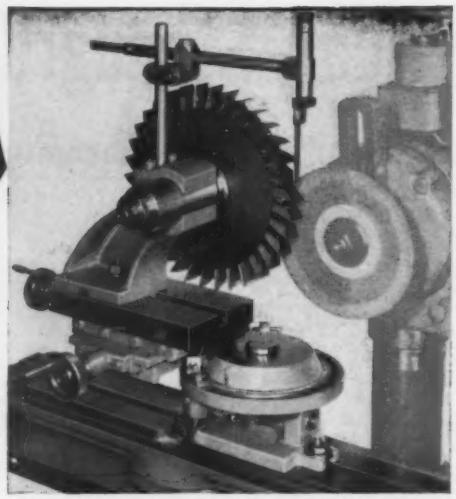
CLUTCHES GO IN TRANSMISSION BOX
This typical arrangement shows a 16-speed unit drive. Note how compactly eight I-T-E Electro Clutches fit into this small space. Clutches are available in ratings from 3.2 to 45,000 ft. lb. running torque.

I-T-E CIRCUIT BREAKER COMPANY Transformer & Rectifier Division

THE UNIVERSAL RADIAL CUTTER GRINDING FIXTURE

Does 5 Operations without removing cutter from its ARBOR!

On cutters up to 8" in diameter, the No. 6 fixture, as shown with our No. 6A heavy-duty, right-angle, ballbearing spindle workhead:
Sharpens side teeth on **both** sides.
Sharpens peripheral teeth.
Generates small or large radii on **both** corners of each tooth.
(Other workheads available)

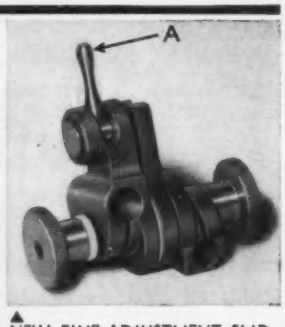


▲ THESE DEPENDABLE GRINDING FIXTURES SAVE THE LIFE OF YOUR CUTTERS. Write for our catalog 602

◀ UNIT 1A
This Universal Cutter Grinding Fixture fits any universal tool or surface grinder.

Radial Grinding Attachment D combines with Unit 1A for sharpening end mills with square, conical, or ball nose shapes. ▼

▲ UNIT 4A
Radial Grinding Fixture for sharpening fluted end mills with square, conical, or ball-nose mills. The index disc provides for multi-flute cutters.



▲ NEW FINE-ADJUSTMENT SLIDING SWIVEL GIVES SMOOTH, PRECISE INDICATOR SETTING. Smooth, positive positioning of finest dial indicator is readily accomplished by the fine-adjustment Sliding Swivel. Final precise positioning is accurately made by slight movement of convenient lever "A".
WRITE FOR:
SLIDING SWIVEL FOLDER

ROCHELEAU TOOL & DIE CO.
650 North Main St., Leominster 1, Mass.

From the *American Machinist* Library of *Tips for Top Shop Men*

DON'T underestimate the effect of an unsound sales budget on production efficiency. Inaccurate forecasts mean fluctuating schedules, a changing work force, and low worker morale.

How efficient is YOUR shop?

Over 42 per cent of metalworking production equipment is now over ten years of age . . . 19 per cent of it was bought more than 20 years ago!

This means that there is more over-age and obsolete production equipment operating in metalworking shops now than in 1945, and the rate of obsolescence is growing.

How about your shop? Are you equipped adequately with the modern, high-efficiency machinery and equipment which alone can produce the better products that cost *less to buy* which everybody wants? How does your shop compare with those of your competitors, and with metalworking shops generally?

You can find out quickly by writing for a copy of the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment. Here are all the facts on the age and number of 155 major types of production equipment, operating in 15 manufacturing divisions and 25 major production areas. Price: $2.00 per copy.

American Machinist

Reader Service Department

McGRAW-HILL BUILDING
NEW YORK 36

ITALIAN MACHINE TOOLS exhibited at the

CANADIAN INTERNATIONAL TRADE FAIR

May 30th - June 10th, 1955

HOLLOW BORING and DEEP HOLE DRILLING Specialists

Save production time and money on your deep hole parts with our specialized service.

- HOLLOW FORGINGS
- HOLLOW BARS
- CYLINDERS
- CONTRACT HONING
- CONTRACT DRILLING

Send your prints for estimates or recommendations.

Write or Wire Dept. A

HOLLOW BORING CORPORATION
85 Prescott Street
WORCESTER, MASS.

NOW! STOCKED BY YOUR RED-E INDUSTRIAL DISTRIBUTOR

RED-E CENTERS

SUPERACCURATE PRECISION

. . . choice of 98% of Machine Tool Builders

Fast delivery from local stocks—and a guarantee of Superaccuracy with every RED-E center you buy—that is what you get from your RED-E distributor. *He has a type, size* and *model for your every* lathe and grinding need—regardless of the speeds, or the radial or thrust loads. *Buy* only a precision center with *guaranteed accuracy! Buy* only RED-E, stocked by your RED-E industrial distributor.

RED-E FEATURES 7 POINTS OF SUPERIORITY!

- ABCE 5 and 7 precision bearing specifications
- Preloaded angular contact
- Locked-in bearing assembly
- Lubrication sealed-in for life
- Labyrinth enclosure which seals out coolants and foreign matter
- High speed steel points
- GUARANTEED ACCURACY

REPLACE with RED-E — and be SURE!

Phone your nearest RED-E Industrial Distributor today!
Literature Available, No Obligation.

DISTRIBUTORSHIP INQUIRIES INVITED

CENTER *Specialists Since 1908*

RED-E TOOLS **READY TOOL COMPANY**
548 Iranistan Ave. • Bridgeport 5, Conn.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** EQUIPMENT: USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line. Position Wanted advertising rates are ½ the above rate payable in advance.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements.

The advertising rate is $12.60 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

EMPLOYMENT ADVERTISING:—New Employment Opportunities Section for Displayed ads starting July 4 issue. For details see announcement ad in this section.

EARN $1000 MONTH AS TOOL, DIE DESIGNER

Tool and die designers are *in demand*—and Acme is the *only* school in America offering complete tool and die design training—Acme graduates step right into responsible, high-paying positions. NOW you can take the same course taught in our resident schools by CORRESPONDENCE in your spare time. Training made sure and easy through our famous Cope System. If you can finish high school, you can master this profession! Prepare for a career in an $8000-$15000 yearly salary bracket—write today to ACME SCHOOL OF DIE DESIGN, Corres. Div. A, 8 N. Jefferson Street, Dayton 2, Ohio. *Approved under PL550 for Korean Veterans training.*

ESTIMATOR WANTED

Calculate Machining time. Write Operation Sheets. Plan tools, jigs and fixtures. Must be thoroughly experienced, precision machine shop methods.

ACCURATE MACHINE PRODUCTS CORP.
JOHNSON CITY, TENNESSEE

2 MACH. SHOP FOREMEN

SALARY START $600-$700

Midwestern mfr. 3000 employees—all types machining operations. Definite further oppor. with aggressive organization.

RAY EDWARDS & ASSOCIATES
28 E. Jackson, Webster 9-2905, Chgo. 4, Ill.

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.

GENERAL PATTERN WORKS
2233 Ruck Street Cincinnati, Ohio

Replies: (Box No.) Address to Office Nearest You.
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

Manufacturers' Representatives — to represent large Mid-Western manufacturer of speed reducing transmissions and cut gears of all types, on a commission basis, for territory of Detroit, Michigan or Birmingham, Alabama—must be experienced in engineering and sales—all replies will be held strictly confidential. RW-6299, American Machinist.

EMPLOYMENT SERVICE

Salaried Positions, $5,000 to $35,000. We offer the original personal employment service (established 45 years.) Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 652 Brisbane Bldg., Buffalo 3, N. Y.

SELLING OPPORTUNITY WANTED

Wanted Machine Tool Lines and equipment by upper Midwest dealer with large acquaintance and excellent performance record. SA-6325, American Machinist.

ATTENTION . . .

EMPLOYMENT ADVERTISERS

Effective with the July 4th issue, a new section will start in American Machinist. We will head this section: EMPLOYMENT OPPORTUNITIES. All Displayed Employment Opportunity advertising will be placed in this new section, with the exception of those advertisers who contract for run-of-book position. New advertisements will be billed at the transient rate of $16.65 per inch unless on contract. Contract rates furnished on request. Ads are subject to Agency Commission.

BUY FROM STOCK
Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

LATHES

27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type, 1942.

18"x10' MONARCH "BB" Grd. Hd. Lathe, 72" centers, Taper Attach., Flame Hardened Bed, Late Type.

24", 36", 42" BULLARD Vertical Turret Lathes, New Era, Turret Hd., Side Hd. M.D.

1A WARNER & SWASEY Turret Lathe, Heavy Duty, Power Chuck Wrench, Timken Bearing.

No. 2, 4, 5 WARNER & SWASEY Geared Head Turret Lathes, Bar Feed.

24"x10' AXELSON Geared Hd., H.D. Model "E" 28" Actual Swing, M.D., Taper Attach.

No. 7 BARDONS & OLIVER Universal Turret Lathe, 2½" capacity. Preselector Head.

MILLING MACHINES

No. 2-18 CINCINNATI Plain Auto. M.D., Late

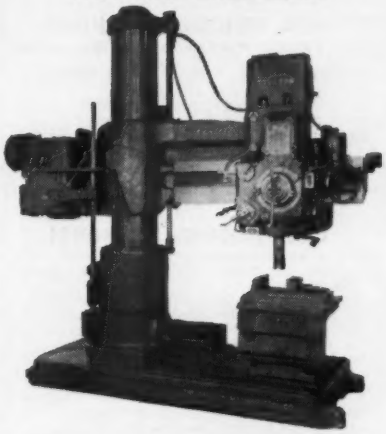
No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D., Late.

No. 1-8 KENTS OWENS Hydraulic Horiz. Mill, Late Type, M.D.

6' arm x 17" column FOSDICK Economax Hydraulic Radial Drill, Motor on arm, late type. 1944

6' arm x 19" col. CARLTON Radial Drill, 20 HP., late type. 1943

DRILLING MACHINES



4' ARM, 15" COLUMN CARLTON RADIAL DRILL. 48 SPINDLE SPEEDS 15-1500 RPM. MOTOR ON ARM. 1943.

No. 262 BARNES Motor Driven Sliding Drill Press, 2" cap. in steel, 1941.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

400 tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support. M.D.

No. 0, 1, 2 BUFFALO FORGE Vertical Angle Bending Rolls, M.D.

#21½ BLISS O.B.I. Press, 56 tons cap., M.D.

No. 6 FEDERAL O.B.I. Press, 65 tons, cap., single geared, 4" stroke, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

30" ROCKFORD Hydraulic Openside Shaper, with Side Head, Late Type.

No 20 WATERBURY FARREL Thread Roller, ⅜" cap. 1944, Motor Driven.

No. 8LS FELLOWS M.D. Gear Lapping Machine. Detachable Head, Univ. Work Support.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine. M.D. Late type.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

GRINDERS

6" x 18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

#3 Brown & Sharpe Univ. Cyl. Grinder, M.D.

#TG615 JONES & LAMSON Thread Grinder, Lathe, M.D. and TG848.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

5" UNIVERSAL HORIZONTAL BORING, MILLING, DRILLING MACHINE. TABLE TYPE, 55" x 91" Table, 24 Spindle Speed 7.0 to 850 RPM. NEW in 1948.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK... SEND US YOUR INQUIRIES

FOR SALE

Or Will Lease to responsible party

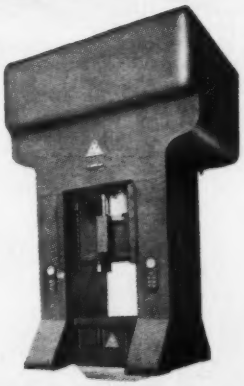
Complete GEAR MANUFACTURING PLANT

With all facilities for blanking, gear cutting, etc. Practically all equipment late model.

Very favorable price. Located Indianapolis.

B. A. WINSTON
326 West Ohio Street
Indianapolis 2, Ind.
Telephone: Melrose 5-2408

PRESS OF THE MONTH



1500 TON HYDRAULIC PRESS

#H-1500-54 CLEARING

Serial #40-4741

(Practically New Condition)

Maximum Stroke ..... 24"
Maximum Daylight (Stroke up) ..... 54"
Bed Area (R to L x F to B) ..... 54"x48"

Equipped with 125 HP motor
(3 phase, 60 cycle)

JOSEPH HYMAN & SONS
2600 E. TIOGA ST. PHILADELPHIA 34, PA.
Phone: GArfield 6-5025

SALES ASSOCIATE

California Representative for lucrative national tooling lines plans retirement and seeks right party party to gradually take over business, on long term payment basis. Must be a Salesman.

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D6 Colburn Heavy Duty, m.d.
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24" Aurora, m.d.
24" Cincinnati Bickford, m.d.
26" Aurora, m.d., taper
32" Aurora, belt drive
36" Cincinnati-Bickford, belt drive
No. 2 Colburn Mfg. Type, m.d.
No. 315 Baker Heavy Duty, s.p.d.
No. 417 Baker, m.d., later type
No. 513 Baker, m.d.
#4-48" Defiance Machine Co. Drill, m.d.

GEAR SHAPERS
No. 12 and 18 Fellows Gear Shaving Machines, m.d., late
No. 6 Fellows, belt drive
No. 7, 7A Fellows Gear Shapers, belted m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61 Fellows, belted m.d.
No. 61 Fellows, gear box m.d.
No. 61A Fellows, m.d., latest type
No. 64S Fellows, m.d.
No. 645A3 Fellows, m.d.
No. 72A Fellows, m.d.
No. 75 Fellows High Speed, m.d.
No. 75A Fellows, m.d.
No. 712 Fellows, m.d.
No. 4 Fellows Gear Generator, m.d.
No. 715A Fellows High Speed Gear Shaper, m.d.
No. 8B Fellows Gear Burnisher, m.d., late

GEAR CUTTERS
No. 12 Gleason Straight Tooth Bevel Gear Rougher, m.d.
No. 36BM Gould & Eberhardt Spur Gear Cutter
Gleason Spiral Bevel Gear Rougher, m.d.
No. 3-36" Brown & Sharpe Gear Cutter
No. 4B Fellows Gear Burnisher
No. 8B Fellows Gear Burnisher
3" Gleason Gear Generator, m.d.
8" Gleason Gear Generator, m.d.
11" Gleason Gear Generator, m.d.
No. 6-60 Brown & Sharpe Gear Cutter, m.d.
Cincinnati Gear Burnisher, m.d.

GEAR GRINDING MACHINES
6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur & Helical
No. 13LS Fellows Gear Lapper, m.d.
SG11 Gear Grinding Machine, m.d., latest
GG19 Gear Grinding Machine, m.d., latest
GG31 Gear Grinding Machine, Internal Gear & Spline Grinder, m.d.
10" Pratt & Whitney Model M1639 Single Wheel Gear Grinding Machine, m.d.
18" National Broach Red Ring Gear Lapper, m.d., late

GEAR HOBBING MACHINES
Type A Barber-Colman, m.d.
No. 5AC Lees-Bradner Heavy Type Gear Generator, m.d.
No. 12 Barber-Colman Double Overarm, m.d.
No. 12 Barber-Colman Single Overarm, m.d.
No. 34 Brown & Sharpe, m.d., Spur & Spiral
No. 44 Brown & Sharpe, m.d.
No. 130 Cleveland Rigid Hobber

GEAR TESTERS
No. 1 Brown & Sharpe Spur Gear Tester
12" National Broach & Machine Co.
18" National Broach & Machine Co.
18" Gleason Bevel Gear Tester, m.d.
No. 471 Michigan Tool Co. Hob, Reamer & Gear Checker

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Kwik-Way Model H Piston Turning & Grinding Machine, m.d.

CENTERLESS GRINDERS
No. 2 Cincinnati, m.d.
No. 3 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. 3/8" valve seat, m.d.

CARBIDE GRINDERS
#44 and 49 Excello Double End

CRANKSHAFT GRINDERS
18x66" Landis Universal Type C, m.d., late
22"x72" Landis Type CH, m.d., late

CYLINDER GRINDERS
No. 73 Heald Airplane Cylinder Grinder, m.d., new
Model FG Micro Cylinder Grinder, m.d.
No. 78 Heald Centerless Cylinder Grinder, m.d.

SURFACE GRINDERS
36"x86"x36" Diamond Hydraulic Face Grinder
No. 2B Brown & Sharpe, m.d.
No. 12I Hanchett Production Face Grinder, type BD, m.d.
No. 33 Abrasive Vertical, m.d.
14" Pratt & Whitney Vertical, m.d.
No. A-1-8" Arter Surface Grinder
No. 22—12" Heald Rotary, m.d.
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No. 2LMS L-G—2 spdl.—20" sw.
No. 3 Avey—2 spdl.—24" sw.
No. 2MS Allen—3 spdl.—24" sw.
No. 2 LMS L-G—4 spdl.—14" sw.
No. 2MS Allen—6 spdl.—24" sw.
No. 3B Edlund—6 spdl.—30" sw.
No. K60H Fox Multiple

GEAR MACHINES
11" Gleason Gear Generator
No. 36BM Gould & Eberhardt
No. 615A Fellows Gear Shaper
No. 612A Fellows Gear Shaper
No. 65 Fellows, Cone Drive
No. 12HS Gould & Eberhardt

GRINDERS
No. 4H—4"x12" Landis Plain Cyl.
5"x30" Norton Cam-O-Matic
5"x42" Norton Type C Pl.
6"x18" Norton Type C Plain
8"x15" Elgin ER-5C
10"x18" Norton Type C Pl. Cyl.
10"x36" Norton Type C
10"x36" Norton Type C Cam Gdr.
14"x48" Landis Type C Plain
16"x36" Norton Type C Pl.
16"-26"x72" Norton Pl.
18"x120" Norton Type A Plain
20"x192" Norton Type A Plain
24"x264" Norton Type A Plain
No. TG615 J. & L. Thread Grinder
No. 81 Heald Int. Centerless
No. 74 Heald Int. Centerless
No. 72-A Heald Univ. Int.
No. 72A5 Heald Int. (1942)
No. 5 Bryant Internal
No. 5A Bryant Hole & Face
No. 5B Bryant Internal
No. 16-16 Bryant Internal
No. 16-28 Bryant Internal
No. 16A16 Bryant
No. 16A-28 Bryant Internal
No. 16F-28 Bryant Internal
No. 16-38 Bryant Internal
No. 24-26 Bryant Internal
No. 24-36 Bryant Internal
No. 24L-36 Bryant Internal
No. B24—25" chuck Arter Surf.
No. 214 Besly Dbl. End Disc
#8 Badger Hanchett Double End Disc.
Hill-Clarke Cyl. Norton Type M.D.
10"x36" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x50" centers
14"x72" centers
14"x96" centers
18"x96" centers
18"-30" gap x 96" centers

LATHES
12"x21" Fay Automatic
16"x21" Fay Automatic (1944)
16"x32" R-14 Seneca Falls
16 ML 16 LeBlonde Semi-Auto.
18"x27" ce American Grd. Hd.
27"x84" ce American Geared Hd.
36"x126" ce Putnam Geared Hd., M.D.
No. 2 Warner & Swasey Grd. Hd.
No. 2 Warner & Swasey Elec. Hd.
No. 5W Acme Universal
No. 6 Warner & Swasey, bar fd.
No. 7A Jones & Lamson
No. 2A Warner & Swasey
3A Warner & Swasey Turret (1942)
No. 3AL Gisholt Cross Slide
No. 3H-10 Libby International
No. 5A Warner & Swasey Turret Lathe
No. 4A Warner & Swasey M.D.
No. 4A Warner & Swasey (1944)

MILLING MACHINES
No. 2HL K. & T. Milwaukee Plain
No. 4 Cincinnati Dial Type Plain
No. 08 Cincinnati Vertical
No. 4H K. & T. Milwaukee Vert.
118 Van Norman Hyd. Mfg. (1942)
Model A Briggs Mfg.
54"x30"x16' Ingersoll Slab
10"x60" Pratt & Whitney Thread
12"x102" HT Lees-Bradner Thread
Model CT Lees Bradner Thread Mill (1942)
No. 118 Van Norman Hyd. Mfg. Mill

PLANERS
48"x36"x14' Gray
60"x48"x27' American, 4 heads

MISCELLANEOUS
No. 2L-6 La Pointe Horiz. Hyd. Broach
8 Spdl.—6" Goss & DeLeeuw Chucker
No. 56 Sundstrand Double End Cent. Mach.
Foote-Burt 1 Spdl. Boring Mach. (1941)
15" Dill Slotter
18" Dill Slotter
Model 200 Micromatic Hor. Hone
Model H-7 Micromatic Vert. Hone
No. 224 Barnes Vertical Hone
No. 306 Barnes Vertical Hone
No. 6 R. & K. Straight Side Press 42"-ga. Economy Shear, M.D.

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EDLUND, 1-Sp. Model 2B-8, No. 3 MT ... $ 850

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CINCINNATI 6"x18", Mod. EA Cyl. Fil. ... $2,250
NORTON 10"x48", Model C Cyl., Rebuilt $7,950
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HEALD 72A3 Pl. Int. X-Sliding Wkhead ... $3,750
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HEALD 72A3 Size Internal, new 1930 ..... $ 900
HEALD 74 Long Base Internal, New 1941 $5,450
HEALD 172 Sizematic Internal, 36" Swing $3,450
GRENBY 1G-12 Internal, 1942 ..... $ 950

LATHES, TURRET
BULLARD 42" Vert., New Era, 20 HP $3,950
W&S No. 4 Pre-Selector, Air Chuck Reblt. $4,500
W&S No. 4 Gd. Hd., 1936, Chuck, Tooling $2,750

MILLING MACHINES
CINCINNATI No. 3 Horizontal, Hi-Power $3,750
CINCINNATI No. 4 Horizontal, Hi-Power $3,950
HANSON-WHITNEY 4"x9" Thread, Rebuilt $3,450

MISCELLANEOUS
HEALD No. 49 Double End Borematic $4,750
GORTON 16A and 16B Auto., 7/16" Cap. ... $2,950
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HAMILTON 42"x42"x12' Planer, 4 heads ... $2,150
CINCINNATI 42"x36"x12' Planer, 2 heads $1,950
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FELLOWS: Flat Top Helical Gear Cutter
OLIVER: 10" Template Tool Bit Grinder

DRILLING MACHINES
ALLEN: No. 2 Drill—6 spindle, 8"
ALLEN: #2½ High Speed 15" #3 MT
BARNES: No. 210 2-spindle, 21" swing
PRATT WHITNEY: ½Bx50" Deep Hole Reamer
RADIAL DRILLS: Arshdale, 5', 6' & 7', new

GEAR & SPLINE MACHINERY
FELLOWS: #61 Shaper—35" dia.
FELLOWS: 61A & 64A Shapers, 18" dia.
GLEASON: #12 Rough & Finish Generator
SYKES: Rack Cutting Machine 12" to 36"
FELLOWS: Gear Lappers, 8LSI and 13LSI
GLEASON: Testers, #6
NAT. BROACH: SIC-12" Red Ring Tester
CLEVELAND: #130 & 140 & 140H Rigidhobbers
GEAR GRIND. MACH: GG-19 10"x24" Hydraulic
GLEASON: #17 Gear Grinder, 23½" P.D.
PRATT & WHITNEY: 10" & 18" Gear Grinders, 1 & 2 wheel Hydraulic
INTERNAL GEAR GRINDER: GG-31

GRINDERS—CYLINDRICAL
BROWN & SHARPE: #10 6"x18" plain
CINCINNATI: 6"x18" plain hydraulic
LANDIS: 16"x32" Type "D" Crankpin
NORTON: 12"x18" TYPE C Universal
NORTON: 10"x36" 30° Angle Wheel
NORTON: 10"x18" 45° Angle Wheel
NORTON: 14"x36" Plain

GRINDERS—INTERNAL
BRYANT: #1112EY High Frequency
BRYANT: #5, 16-16, 16CP16, 16-28, 24L36
HEALD: #50 Planetary
HEALD: #72A3 Plain & Sizematic
HEALD: #72A5 65° Extended Bridge

GRINDERS—RADIUS
VAN NORMAN: #73 capacity 7½"
VAN NORMAN: #649-16, cap. 6" to 16" dia.
VAN NORMAN: #3½, Universal

HONING & LAPPING MACHINES
BARNES: Model 224 4" dia. x 16" stroke
BARNES: Model 172, 2" dia. x 6" stroke
MICROMATIC: H-510 double end horiz., 2" dia.
MICROMATIC: H-2 single end 2 spindle, 1" dia.
FELLOWS: 8LSI & 13 LSI Gear Lappers

LATHES—PRODUCTION
BLOUNT: Speed Lathe 12"x48"
LEBLOND: 16"x30" Automatic
LODGE & SHIPLEY: #3A Duomatic 25½"x27"
POTTER & JOHNSTON: #4D Auto Turret

LATHES—TURRET
BULLARD: 36" Vertical Turret
WARNER & SWASEY: #1A, #2A, #3, #3A, #4, #4A and #5
HERBERT: #0, #2, #4, #7, #8 and 9B30, new
WEBSTER & BENNETT: Vertical 36" & 48"
JONES & LAMSON: #8A bar and chuck
OSTER: #601 Turret

MILLING MACHINES
TAYLOR-FENN: M-80 Duplex Spline
RICE—BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller

SAWS & CUT-OFF MACHINES
RUSSELL: 9½" Cut-Off Saw with Auto. Feed
RUSSELL: 5½" Cut-Off Saw with Auto. Feed
NOTCH & MERRYWEATHER: #3 Saw
MARVEL: #6A Hacksaw, 6"x6", Auto. Feed

THREAD MILLERS & TAPPERS
HALL PLANETARY: Mod "D" Thread Miller
LANDIS: 2½" Single head horiz. Threading
LEES BRADNER: #40A Thread Miller
LEES BRADNER: CT-36 Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. cap.
PRATT & WHITNEY: 4½x12" Thread Miller

MISCELLANEOUS
GARDNER: #84A Double Disc Grinder, 23" wheel
MOLDING MACHINES ROLLER JOLT: Osborne 2047-3
AUTOMATIC SCREW MACHINE: Wickman, Single Spindle, 7/16", new
TEST STAND: Denison 918-AM Hydraulic
HARDNESS TESTER: Gagan Brinell 16-8
SHEFFIELD PRECISIONNAIRE GAUGE
SUNDSTRAND: Double End #53 42" & 60" Centering Machines
HEALD #22 Rotary Surface Grinder
WICKMAN: Optical Profile Grinder (NEW)

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CLEVELAND 5¾" single spindle; late type
CONOMATIC 1⅞", 8-spindle; M.D., late type
NEW BRITAIN GRIDLEY Model 665; 6-spindle chucker; latest type; new 1943.

BORING MILLS—Horizontal
JIG BORERS
DIXI type 60 Swiss Jig Borer; 2.362" bar; late type
FOSDICK #30A Jig Borer; late type
HEALD #45, 49, double end Borematic; M.D.
HY-PO #31 Jig Borer; late type
LUCAS #21 2½" bar; table type
LUCAS #42 Precision; late type
NILES 8" bar; floor type; motor drive
UNIVERSAL "Tri-Way" 3" bar; late type

BORING MILLS—Vertical
BULLARD 8", 8-spindle & 18" 6-spindle Type "D" Mult-au-matic; late type
BULLARD 24" spiral drive; PRT; late type
NILES 53", 2 swivel heads, PRT; M.D.
NILES 100" 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

BROACHES
CINCINNATI I-30 Duplex Vertical cap. 1 ton 30" stroke; Hydraulic; late
COLONIAL VGI-10-48 Vertical; Hydraulic; late type
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR 3XA horizontal; cap. 20,000 lb; 56" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type.

DRILLS—Manufacturing
AVEY #2—2 spindle high speed, motor drive, late
BARNES #262 Heavy Duty Camel Back; late type
BARNES H-2 Hydram; 2" cap.; 22" swing; hydraulic
CLEVELAND "A" 5¾" single spindle; late type
LELAND-GIFFORD 1LMS, 4-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 2-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 4-spindle, M.D.; late
NATCO B-4-B "Hole Steel" 60 adj. spindles; late
NATCO B-3-B "Hole Steel" 12 adj. spindles; late
NATCO E-5 high speed, 10 adj. spindles; late

FELLOWS GEAR EQUIPMENT
FELLOWS No. 6 High Speed Gear Shaper; late
FELLOWS No. 48 High Speed Gear Shaper; Internal cap. 72" diameter; late type
FELLOWS No. 61A & 615A High Speed Gear Shaper
FELLOWS No. 672 High Speed Gear Shaper; late
FELLOWS No. 7A, No. 72 and No. 75 High Speed Gear shaper; late type
FELLOWS No. 13 LS Lapper; motor drive, late
FELLOWS 20-M Red Liner; New 1954
FELLOWS 24-M Involute Measuring Machine; 1954

GLEASON GEAR EQUIPMENT
GLEASON 3" Spiral Gear Generator; late type
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON No. 13 Hyp. Cutter Sharp; latest type
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late type
GLEASON No. 14 Spiral Bevel Hyp. Gear Grinder
GLEASON #16 Hypoid Gear Generator, motor drive.
GLEASON No. 17 Spiral Bevel, Zerol and Hypoid Gear Grinder, M.D., late type
GLEASON No. 18 Gear Tester and Lapper; M.D.
GLEASON No. 20 Spur Gear Tester; latest type
GLEASON #22 Hypoid Formate Gear Finisher; late
GLEASON 25" Straight Bevel Gear Gen.; M.D.
GLEASON 24" and 37" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.
BROWN & SHARPE #3 Univ. motor drive, late type
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 6"x18" Mod ER Plain, "Filmatic"; late
CINCINNATI #2 Centerless, Model EA Filmatic; late
LANDIS 20"x144" Plain Cyl. gap type, M.D., late
LANDIS 4"x12" Type H Hydraulic; late type
LANDIS 10"x18" type C Plain, Hydraulic, late
LANDIS 10"x36" type DC plain hydr. with infeed; late
LANDIS 16"x36" type "C" Universal, M.D. late
LANDIS 20"x144" Plain Gap Grinder; late type
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type
NORTON 10"x48" Type C Hydr. Plain Cyl; late type
NORTON 16"x72" Type "C" Plain; late type

GRINDERS—Internal
BRYANT #5 Internal, hydraulic, late type
BRYANT #16-C-16 Internal, Hydraulic, late
BRYANT #24—36" Internal, hydraulic
HEALD #70A Internal, motor drive, late type
HEALD #78 Centerless; motor drive; late
HEALD #81 pl. chuck type, hydraulic; New 1947

LATHES, Turret
GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late type
LIBBY #4H, 12" hole, motor drive, late type
MOREY #2, #3, #4, #5, ram type; Timken; latest
WARNER & SWASEY #1-A Universal; Hex., late
WARNER & SWASEY #2 Geared Head; late type

LATHES, Engine & Mfg.
AMERICAN 18"x102" centers, "Pacemaker"; late type
AMERICAN 36"x25' c.c., PRT; 2 cross slides; late type
GISHOLT #12 Hydraulic Automatic; motor drive; late
HENDEY 24"x36" centers; motor drive; late type
HENDEY 16"x72" centers; M.D., late type
LeBLOND 20"x48" centers, Timken; M.D., late type
LeBLOND 42"x108" centers, Timken; M.D., late type
LODGE & SHIPLEY 12"x30" centers, Toolroom
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" centers, Toolroom; late
MONARCH 12"x30" centers; Model CKK; late type
MONARCH 16"x54" Centers, Motor Drive
MONARCH 16"x78" centers, Model CW, Timken, late
MONARCH 16"x78" c.c. Model CW; Timken; late type
MONARCH 20" (raise to 3½") x 144" c.c., late type
NILES 30"x50" bed, single and boring, "Time Saver"
NILES 30"x100" c.c. Geared Head; Timken; late
NILES 36"x100" centers "Time Saver"; motor drive
PRATT & WHITNEY 16"x30" centers; Timken, late
SPRINGFIELD 20"x40" c.c., motor drive; late type
SUNDSTRAND 10"x60" centers; auto Type B; late

MILLING MACHINES, Plain
BROWN & SHARPE #2 M.D. late type
BROWN & SHAPPE #10, motor drive; late type
CINCINNATI I-18 Production; Timken; late type

MILLING MACHINES, Thread
HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x36" and 6"x72"; #HT 12"x24" and #HT 12"x36" centers; late type
MOREY 12"x30" and 12"x160" centers; late type

MILLING MACHINES, Vertical
CINCINNATI #4 High Speed Dial type; late
CINCINNATI 0-8 Vertical; Timken; late type
CINCINNATI #3 Dial Type; High Speed, New 1953
KEARNEY & TRECKER 3K late

PLANERS
GRAY 48"x48"x10' "Maximum Service" 4 hds; PRT; DC; Reversing, Late type
LIBERTY 144"x76"x48" adj. openside; box table; 4 hds; vari-voltage; PRT; New 1940
NILES-BEMENT-POND 72"x72"x30"; 4 hds; PRT; DC; M.D.

PRESSES
BLISS #410A, 825-ton double action toggle drawing press; M.D.
NATIONAL #5 "Maxi-Press", 1000-ton cap. H.S. Forging Machine; M.D.
SHAW 250-ton Hydraulic flanging press; late type
WATERBURY FARREL #9, 125-ton cap., M.D.

SHAPERS
CINCINNATI 20"; motor drive; late type
GOULD & EBERHARDT 32"; High Speed; M.D.
HENDEY 12" High Speed Univ. Crank Shaper; late
MOREY 8" Vertical; motor drive; late type

MISCELLANEOUS
ALEXANDER #2, 3-dim. Engraving NEW 1952
AVEY No. 2, 2-spindle Drill Press; late type
BARNES No. 172 Honing; M.D., hydr.; late type
HILLES & JONES #7 Plate Bending Roll; capacity ⅞" x 16"; motor drive
LeBLOND No. 2 Deep Hole Reaming, late type
LeBLOND No. 2 Deep Hole Rifling, late type
HUGH SMITH cap. 1" thick plate x 25' between housings-Plate Bend. Roll, M.D.

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72" Niles Bement Pond Vert. Boring Mill — older but good.
No. 47 Heald Single End Boremastic Serial #4646
3'9" Morris Mor - Speed Radial Drill.

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SEARCHLIGHT SECTION

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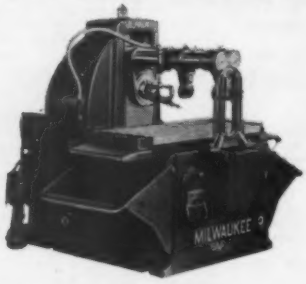

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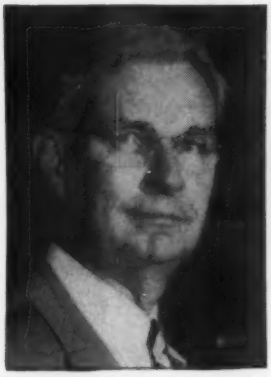

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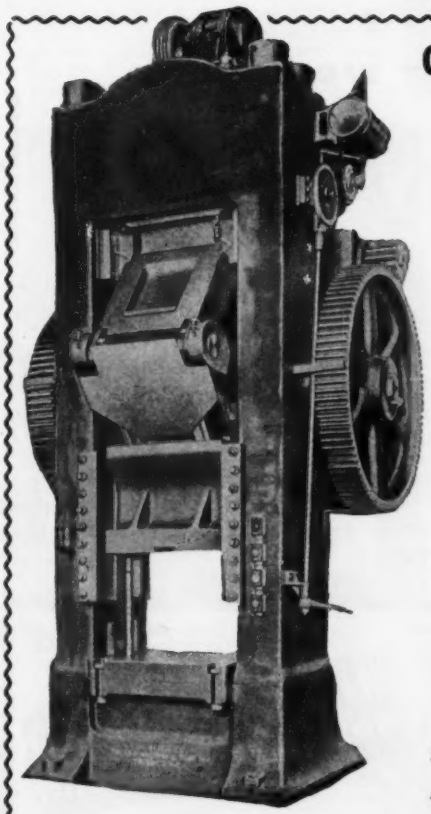

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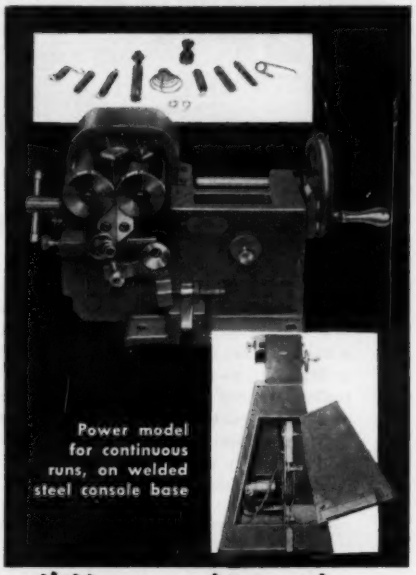

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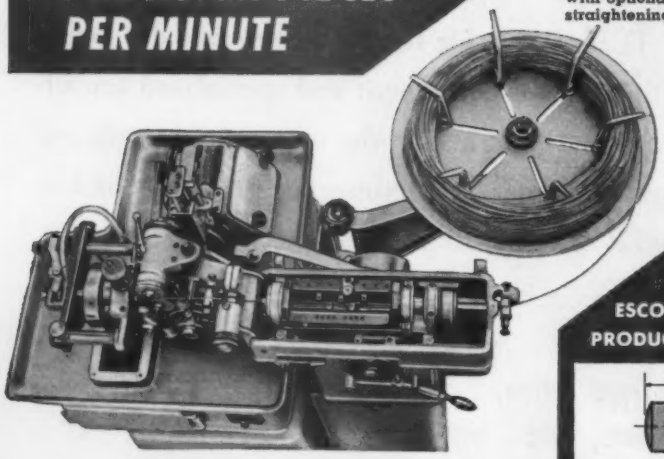

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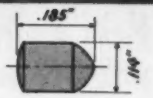

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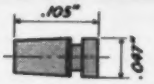

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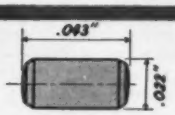

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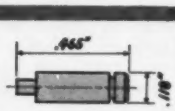

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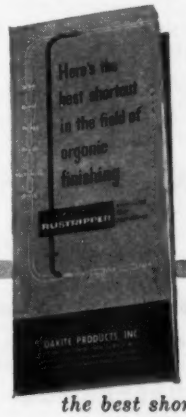

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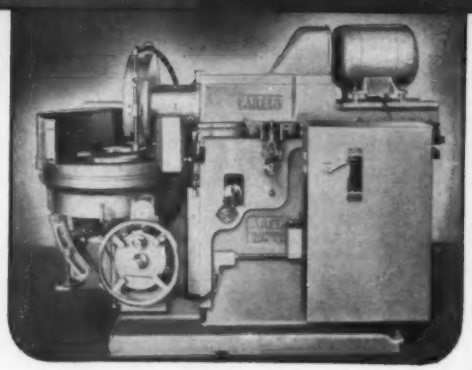

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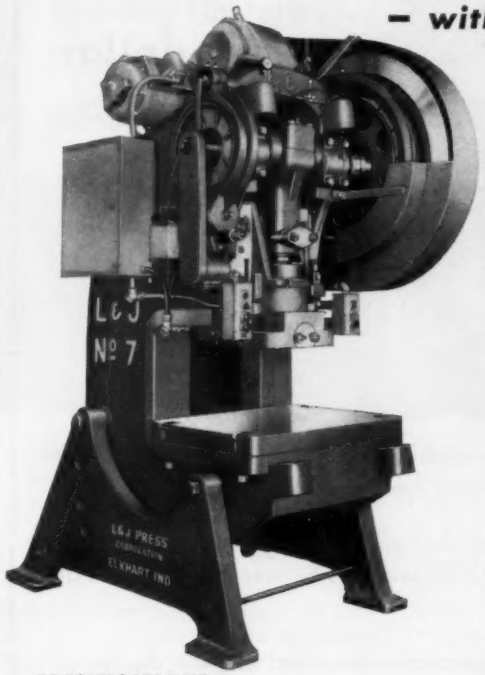
NEW L&J NO. 7 PRESS

RIGID – ACCURATE – EFFICIENT – with a LARGER WORK AREA



This new press will give you greater production at lower cost. Its alloy iron frame has exceptional rigidity which holds deflection to a minimum and gives closer tolerances, greater uniformity and longer die life. Accuracy is also obtained through adjustable gibs of extra length. The rugged ram adjusting screw has buttress threads and replaceable hard bronze seat. Air clutch optional. Geared and non-geared models.

SPECIFICATIONS

Capacity—75 tons. **Standard Stroke**—4". **Maximum Stroke** (to order)—8". **Strokes** per minute—42 (non-geared type 85). **Throat Depth** center of ram to frame—13½". **Die Space***—14" to 22". **Bolster Plate Area**—36" x 26".

* bed to ram, standard stroke down, adj. up.

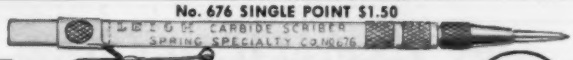
Write for Catalog

Fully describes all L&J O.B.I. Presses—21 geared and non-geared models. Capacities 8 to 90 tons. Also, 20 to 50 ton High Speed, Double Crank Straight Side Presses with speeds up to 450 s.p.m. Ask for Catalog L-12.

Booth 407 – The Machine Tool Show
International Amphitheatre – Chicago

L&J PRESS CORPORATION
1629 STERLING AVE., ELKHART, INDIANA

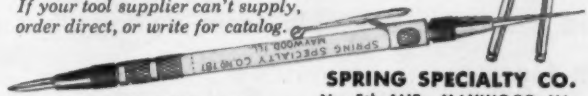
No. 676 SINGLE POINT $1.50



LEIGH *Carbide* SCRIBERS

Marks hardened steel, ceramics, plastics, gems, glass, etc. Polished aluminum body. Black-finish steel screw collets hold the points, easy to reverse for safety or adjust for length. Carbide point is ¼" diameter carbide rod approximately ½" long, copper-brazed into steel, ground to a point, and hand-polished, CAN BE RESHARPENED MANY TIMES. Steel point is hardened, and centerless ground to a long taper.

If your tool supplier can't supply, order direct, or write for catalog.

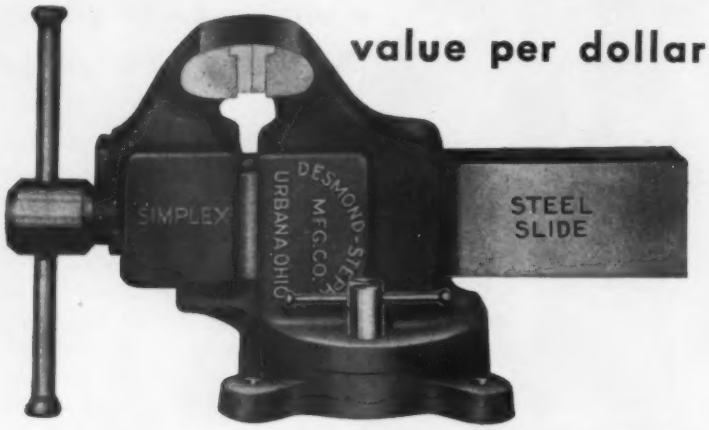


No. 787 DOUBLE POINT $2.50

SPRING SPECIALTY CO.
No. 5th AVE., MAYWOOD, ILL.

MORE

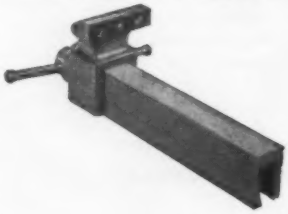
value per dollar



This steel slide—proven unbreakable in years of industrial service—is the extra built into Desmond-Simplex vises—the extra without the extra cost.

Milled from a solid steel bar and fitted through a broached backjaw, it gives the ten models of metal-working vises the strength that withstands the most severe service.

Other features—providing extra convenience and long life: shoulder-fit jaw inserts, full 360° swivel, longer, stronger vise nut, one-piece, non-pinching handle.



STANDARDIZE ON EXTRA VISE VALUES

Desmond

THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO

From the *American Machinist* Library of *Tips for Top Shop Men*

STUDY merchandising's technique for introducing a new product. It'll pay you to try the same methods when installing new equipment. You'll avoid resistance not only from workers but also from foremen.

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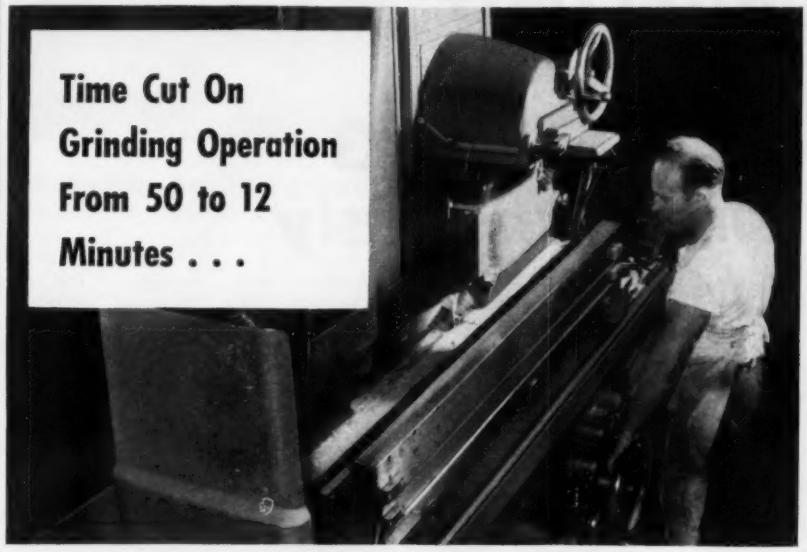


Time Cut On Grinding Operation From 50 to 12 Minutes . . .

With SUNDSTRAND "POWER-GRIP" Magnetic Chucks

Here's another good example of time savings with Sundstrand Magnetic Chucks. Two airplane flap tracks are held at one time for grinding on opposite faces of rail. Grinding stroke is 70 inches. Former time with conventional holding equipment was 50 minutes. With change to Sundstrand "Power-Grip" Chucks time is cut to 12 minutes . . . a savings of 38 minutes per part.

There's a good chance that you may be able to save considerable time in milling or grinding operations with Sundstrand "Power-Grip" Magnetic Chucks. Call in a Sundstrand Engineer. There is no obligation for this service.

Free Data is available on Sundstrand Clamping fixtures. Write today. Ask for bulletin 155-M.

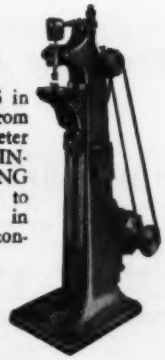
SUNDSTRAND POWER-GRIP ®

SUNDSTRAND Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1020-9th ST. • ROCKFORD, ILLINOIS

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

MILLING *and* CENTERING *simultaneously and in continuous production*

Now these two entirely different operations can be combined on one machine. The Davis and Thompson continuous type Roto-Matic both mills and centers on both ends in one operation. Rough and finish milling cuts on the ends of the shaft and centering of both ends is completed with only one rotation of the fixture drum. The centering heads travel with the work station until centering operation is complete then drop back to next work station and repeat. Automatic equalizing clamping is provided to the fixture. Spindles have micrometric adjustment and spindle carriers are adjustable on the ways to accommodate shafts of various lengths.

FREE DATA on this and other Davis and Thompson machines is available in our bulletin No. 1000.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. MILWAUKEE 16, WISCONSIN

From the *American Machinist* Library of *Tips for Top Shop Men*

THE really competent man multiplies his effectiveness by every man he influences. One man, no matter how able, is still one man, but one man believed in by enough others is unbeatable.

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H. E. Hilty, Mgr.

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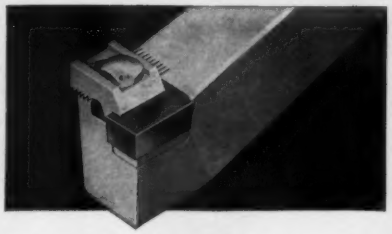
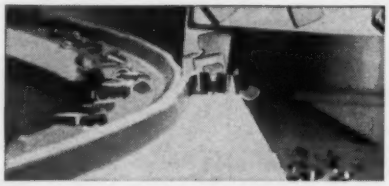


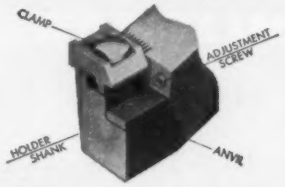
Chip-Hog Heavy-Duty Turning Tools

This line of standard tools recently announced by the Gairing Tool Company is proving this company's claim for "*maximum feeds and speeds on any machine.*" So rigidly constructed as to allow the use of harder carbide grades for given shank sizes, their performance is often limited only by the available machine horsepower.



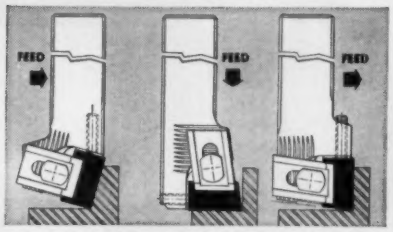
Case Data Show High Feeds and Speeds

Illustration shows CHIP-HOG at work taking a 1" to 1¼" roughing cut around an armor-cast gun turret. With a feed of 3/32", a surface speed of 150-175 per minute was maintained. Your Gairing representative has many more convincing data to show you, mostly on machining hard and tough materials.



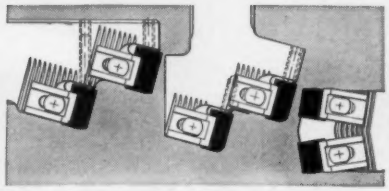
Rugged Parts, Quick-Changed Inserts

With carbide insert removed, holder shows heavy, high-alloy, heat-treated shank. Clamp adjusts sideways on buttress-type serrations, cannot slip. Anvil of hardened and ground tool steel supports insert, prevents holder damage so common in brazed-on tools. Allen screw provides forward adjustment.



Stocked in 3 Styles, Several Sizes

Style 'B' (left above), for straight turning on lathe or boring mill (and for vertical work on planers) is made with shanks 1" by 1" up to 2" by 2". Style 'F' for plunge cutting from the cross slide, and style 'G' for turning up to, or facing a shoulder are standard with shanks up to 1½" by 1½".



Designed for Special Applications

We are repeatedly called upon to furnish *special* CHIP-HOG production tools. These examples from our engineering files combine CHIP-HOG standard construction and parts with special double-insert holders.

Write us, or call our representative for your copy of the CHIP-HOG folder and price list.

THE GAIRING TOOL COMPANY

Tooling—Standard and Special

21226 Hoover Road, Detroit 32, Mich.

COUNTERBORES • E-CON-O-MILLS • BORING BLOCKS & BARS • FINE TOOTH CUTTERS • SPADE DRILLS • SPECIAL TOOLS • CHIP HOG TURNING TOOLS

From the *American Machinist* Library of *Tips for Top Shop Men*

"QUEER DUCKS"—the men that don't fit the pattern—are also the men who don't think like the rest. They'll give you trouble, but they'll usually also give you ideas. Barnyard ducks conform readily to rules, but end up in a pot.

When the need is for SPEED—and PRECISION

You need a

GRAND RAPIDS GRINDER

You get so much more for your money

Every feature of each Grand Rapids Hydraulic Feed Surface Grinder is designed for extra value, extra accuracy, extra high-speed performance.

You get a one-piece column and base. A single massive casting for vibrationless rigidity and permanent alignment between cross travel ways and upright head ways.

You get hydraulic operation of both longitudinal table travel and cross feed. On the larger machine the wheel head is powered for rapid vertical travel to save even more time. *The model 55 has longitudinal table speed of 125 fpm.!*

All parts are machined to micrometric tolerances and precision assembled to give you perfect freedom of action and entire elimination of play.

That's why 6 out of every 10 Grand Rapids Hydraulic Feed Surface Grinders are sold to customers already using Gallmeyer and Livingston grinding machinery. We will be pleased to quote on your needs.

GET THE FULL STORY ON ALL ADVANTAGES

Ask for Grand Rapids Surface Grinders catalog and get full details on all models and accessories. Catalog of Grand Rapids Universal Cutter and Tool Grinders also available on request. No obligation, mail coupon today to:

GALLMEYER & LIVINGSTON CO.
430 Straight Ave., Grand Rapids, Mich.

Please send me the following literature without obligation:

- ☐ Grand Rapids Surface Grinder Catalog
- ☐ Grand Rapids Universal Cutter and Tool Grinder Catalog

NAME: _____

POSITION: _____

FIRM: _____

FIRM ADDRESS: _____

All inquiries will be answered within 24 hours

HOLO-KROME'S MODERN PACKAGING SLASHES YOUR HANDLING COSTS—

. . . all along the line!

From receiving room, to stock room, to production line, to finished product . . . at every step of the way through your plant, Holo-Krome's new packaging saves time and money!

ASSURES FASTER ORDER HANDLING Now, all 7/8" and 1" Socket Cap and Set Screws are packed in new TEN-PAK boxes . . . 1¼" and 1½" Socket Cap Screws in ONE-PAK boxes!

GIVES TIGHTER INVENTORY CONTROL Your stockroom men can now take inventory of Holo-Krome products at a glance! New and smaller clearly labeled boxes are easier to stock and check . . . no lost and wasted screws on the job!

SCREWS ARE FULLY PROTECTED Holo-Krome wraps each TEN-PAK screw in heavy corrugated cardboard liners. Threads can't be damaged, finish can't be marred!

Companies using Holo-Krome products are reaping the benefits of these time-saving, cost-cutting advantages. YOUR COMPANY CAN TOO! Make your Holo-Krome Distributor prove to you how H-K's new packaging saves both time and money!

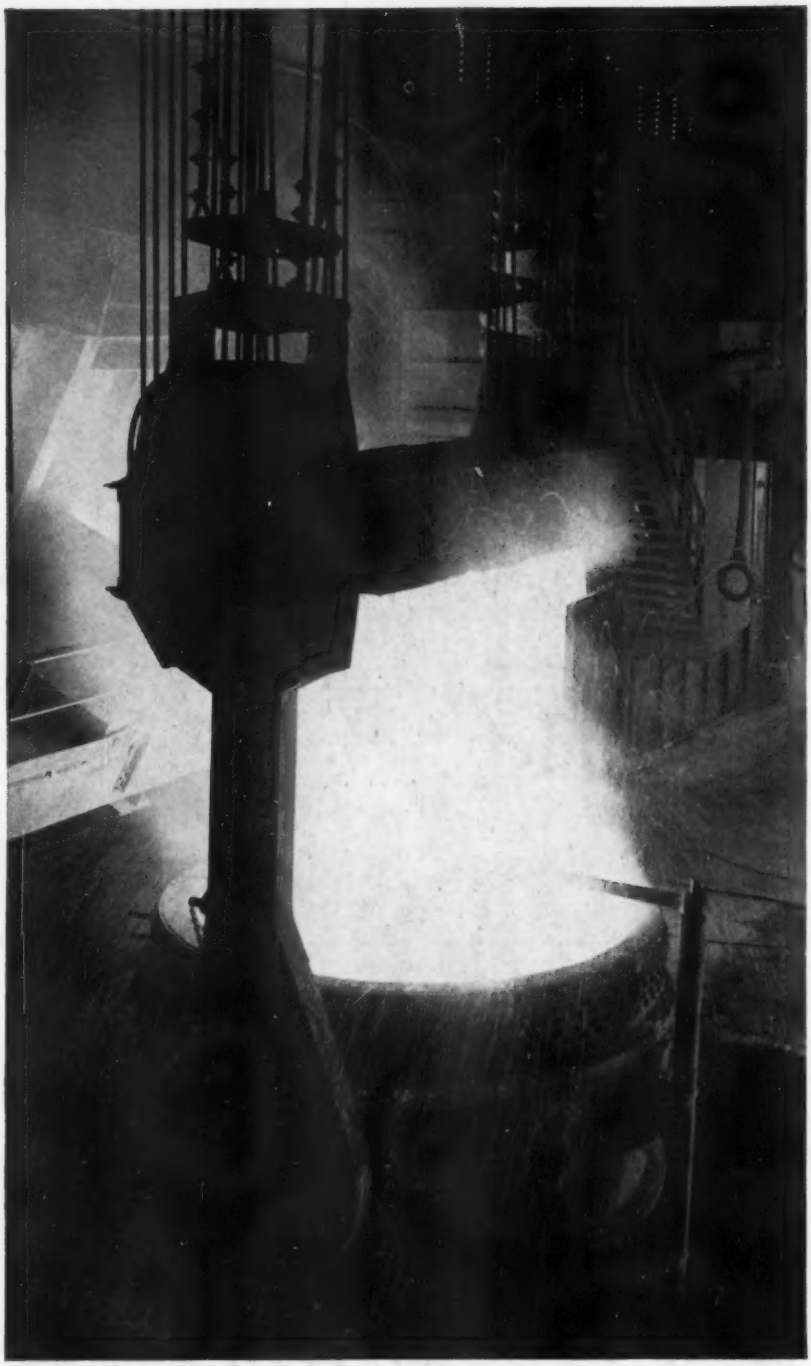
Call him right now!

For the finest in fasteners . . . the fastest service . . . the best in packaging . . . look to your Holo-Krome Distributor.

HOLO-KROME

THE HOLO-KROME SCREW CORP. HARTFORD 10, CONN.

We make our own fine alloy steel—and make it nickel-rich—to make TIMKEN® bearings tougher

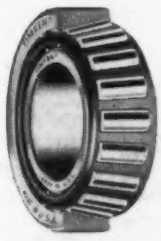


NICKEL makes steel tougher. So, our steel-making specialists don't skimp on nickel in the fine alloy steel we make for Timken® tapered roller bearings. They use exactly the right amount of nickel to give these bearings the toughness they need to withstand shock and last longer. Exacting quantities of chromium or molybdenum or both guarantee uniform hardness. By using the steel industry's first direct-reading spectrometer, we exercise hairline control of each element at the precise instant of tapping the furnace.

Rolling, annealing, and cooling are done with the same meticulous care. And every race and roller that goes into a Timken bearing is precision case-carburized to give it a hard, wear-resistant surface over a tough, shock-resistant core.

We've been specializing in the production of fine alloy steel for almost forty years. We're the only bearing manufacturer in the country that makes its own steel, because it's the only way we can make sure the quality of our bearing steel is just the way we want it. Steel is the heart of the bearing. That's why we insist on controlling bearing quality *every* step of the way—from melt shop to final bearing inspection. And that's why we don't skimp on the use of nickel.

To be absolutely sure of the highest performance standards in the equipment you build or buy, always specify Timken tapered roller bearings. They are made from seamless tubing or forgings by the most modern processes, under strict control. Only Timken bearings roll so true, have such quality thru-and-thru. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

Only **TIMKEN**® bearings roll so true, have such quality thru-and-thru